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ORIGINAL COMMUNICATIONS.

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HEMORRHAGE IN EPIDEMIC INFLUENZA.

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In the recent influenza epidemic which has swept through the land from coast to coast and invaded the Military Hospitals with such intensity, there has been one factor of clinical evidence almost constantly present.

Early in the course of the epidemic at Camp Dodge Base Hospital, the attention of the Head Surgery Service was called to a violent, persistent and remarkably frequent epistaxis that seemed to occur almost as a prodrome, or as an early symptom in the course of the attack. Patients admitted to the hospital invariably complained of a fullness in the head, and on inspection the mucosa of the upper respiratory tract, especially involving the nose, naso-pharynx and fauces, presented a diffusely congested, slightly swollen and dark-red injected appearance. The site of this epistaxis was invariably in the septal mucous membrane, along the course of the septal artery and about the center of the quadrilateral cartilage. An occasional exception in this point of hemorrhage was found in the junction of the septum and the floor of the nose. In some fifteen or sixteen cases where the hemorrhage was observed promptly and bacteriological service was immediately available, blood cultures were made from this septal point during the epistaxis, and in five of these cases the definite presence of streptococcus hemoly-

ticus was demonstrated. This was, perhaps, the earliest evidence of the presence of this specific micro-organism in blood cultures during the epidemic.

Over one hundred and fifty cases of this type of epistaxis have been reported in these investigations in the Service of Head Surgery at Camp Dodge Base Hospital. Of these individual records I have personally observed sixty cases, have made a detailed report of same and have endeavored to tabulate them for statistical and definite conclusions. These conclusions are:

1. This type of epitaxis occurred as a prodrome or as one of the earliest symptoms in the course of the "flu" epidemic.
2. The locality of the epistaxis seemed to be invariably on the septal side of the nose and in the course of the septal artery.
3. Bacteriologic findings indicate that the streptococcus hemolyticus was definitely identified as the causative factor in this form of epistaxis.
4. The cases in which the epistaxis occurred seemed to be those in which the most intense activity and more serious complications developed.
5. Where this epistaxis was spontaneous and violent, subsequent hemorrhage appeared in other localities of the respiratory tract or in other organs of the body.
6. Where epistaxis was found pneumonic complications were quickly presented.
7. Where epistaxis was not controlled by the sero-logical therapy that we carried out the end result to the patient in the large majority of cases was fatal.

In 1913 I conducted a series of observations* on the coagulation time of the blood in patients who presented themselves for operative work in the nose and throat, including the resection of the septum, adenoids, and tonsillectomy. At that time the reduction of coagulation-time of the blood by the use of normal sterile horse-serum was being investigated. In my series of cases I timed in each case the coagulation of the blood preceding the operation, injected 10 cc. of normal sterile horse-serum and again timed the blood coagulation prior to operation. I found that in every instance, even in those of hemapheliacs, the coagulation time, following the administration of the serum was reduced from one to three minutes and found that all patients that registered below the fixed coagulation time limit showed no tendency to hemorrhage during, or after, operation.

It occurred to me, therefore, that this type of epistaxis, associated with a specific micro-organism known to develop an

*Use of Normal Horse Serum as a Means of Controlling Hemorrhage in Oto-Laryngology. The Laryngoscope, October, 1913.

active hemolysis, might be materially benefited by the same form of serological therapy.

By co-operation with the department of general medicine and with the laboratories a general order was issued to inject 10 cc. of normal sterile horse-serum in all patients during the active "Flu" epidemic as soon as epistaxis was observed.

In sixty cases of epistaxis in which this serum treatment was promptly carried out, no mortality is recorded. These patients have been followed to final disposition, namely, to the pneumonia ward, to quarters, or to duty. Even where severe pneumonia developed, the patients have recovered.

It is a significant fact that in twenty-two cases in which epistaxis was found, but where the patient became violently ill and was transferred to the pneumonia wards before the serum could be injected, fifteen were fatal, developing pneumonia, empyema, other complications, and death. There is, therefore, a peculiarly significant relationship in the application of this serum therapy to the hemorrhage pathology developed in the course of this serious "Flu" epidemic. Hemorrhage seems to have been the key-note in the pathological status of each patient.

Another observation to corroborate this hemorrhagic intensity is found in a series of over seventy cases of so-called myringitis hemorrhagica. In these cases the membrana tympani presented either single or multiple, circumscribed, dark-red blebs which, on puncture, exuded a drop or two of bloody serum. In eight of these cases, the bacteriological culture of the contents of these belbs showed the presence of streptococcus hemolyticus. The clinical picture presented in this form of myringitis was not that of the usual acute myringitis where the membrana tympani is diffusely and uniformly congested, and where the mucosa of the tympanic cavity is less injected. The puncture of these blebs was limited to the external epithelial layer of the membrana tympani and did not penetrate the tympanic cavity. Many of these cases, as far as the otologic conditions were concerned, cleared up without further invasion or treatment. Many were complicated by pneumonia and empyema. I merely wish to point to the corroborative evidence in this selective type of myringitis to a hemorrhagic condition closely associated with that found in the nasal and other respiratory mucous tracts.

The fauces, pharynx and the tonsils in almost all of the cases during the serious "Flu" period exhibited the same mahogany-red, intensely injected mucous membrane and swabs from these throats demonstrated the presence of streptococcus hemolyticus

almost without exception. These bacteriological findings run up into hundreds of cases, and when multiplied by similar observations made in the military hospitals throughout the country, into thousands of cases.

Within twenty-four to thirty-six hours after the initial symptoms were developed, in some instances shortly following epistaxis, in others where epistaxis did not occur, the case records of many patients show the admixture of pure blood with the sputum. This I take to be an indication of localized tracheal bleeding. Here again we have evidence of the same hemolytic changes in the mucous membrane of the trachea, or larger bronchi, followed by active bleeding.

In the report furnished by the medical officers in charge of the woman's wards where nurses and civilian females were cared for during the epidemic there is an interesting factor which further corroborates our hemorrhagic pathology, namely, in all epidemic "Flu" cases, menstrual hemorrhage occurred almost as early in the symptoms-complex as epistaxis, irrespective of the normal menstrual period of each patient. There were fewer cases of epistaxis among female patients than in male, but this may be accounted for by the fact that practically every female patient developed irregular menstrual hemorrhage.

In the post-mortem room we have not ceased to wonder at the enormous hemorrhagic character exhibited in the lungs and plural cavity in this epidemic. As someone significantly remarked—"These poor fellows seem to have been drowned in their own blood."

From the Genito-Urinary Department I received the report of several cases of intense hematuria. An autopsy of one patient revealed an active hemorrhage in the suprarenal capsule. In another autopsy the bladder was filled with blood and the mucosa of the bladder showed the same, diffusely injected, dark-red appearance as in the other mucosa tracts attacked by hemolytic changes.

It seems fairly logical, therefore, to conclude that hemorrhage in its various manifestations, hemolysis in its peculiar influence on the character of the mucous membrane and the streptococcus hemolyticus, in its frequent presence in so large a proportion of cases, must have some close pathological relationship and identity. There is still much discussion as to what was actually the original potent bacteriological cause of this epidemic. An eminent authority in bacteriology, terms the causative factor—"streptococcus hemolyticus plus," and the observa-

No.	REGISTER			SYMPTOMS (AT ONSET)												
	Name	Occupation	Race	Temperature	Pulse	Chill	Cough	Coryza	Headache	Nausea	Conjunctivitis	Sore Throat	Backache	Previous Epistaxis	Bleeder	Injury to face
1	J.L.	R. R.....	W.	100.6	90	★	....	★	....	....	....	★	★	....	....	....
2	J.H.	Clerk.....	W.	100.	86	....	....	....	....	....	....	★	....	....	....	....
3	E.B.	Farmer....	W.	102.2	88	★	★	....	★	....	....	....	....	★	....	....
4	H.G.	Nurse.....	W.	102.	126	★	★	....	....	....	....	★	....	....	....	....
5	M.L.	Farmer....	W.	103.4	112	★	★	....	★	....	....	....	....	....	....	....
6	H.B.	Farmer....	W.	100.4	86	....	....	....	....	....	....	....	....	....	....	....
7	F.H.	Clerk.....	W.	102.2	130	....	★	....	★	....	....	....	....	....	....	....
8	J.D.	Farmer....	I.	104.4	110	★	....	....	★	....	....	....	....	....	....	....
9	W.S.	Plumber..	W.	103.8	104	★	★	....	★	....	....	★	....	....	....	....
10	W.K.	Butcher...	W.	101.	84	....	....	....	....	....	....	....	....	★	....	....
11	C.J.	Farmer....	W.	103.4	98	★	★	★	★	★	★	....	....	★	....	....
12	R.W.	Farmer....	W.	102.6	80	★	★	....	★	★	....	★	....	....	....	....
13	R.B.	Farmer....	W.	100.	68	★	★	....	★	....	....	....	....	★	★	....
14	E.D.	Laborer...	W.	101.6	88	★	★	....	....	....	....	....	★	★	....	....
15	S.V.	Laborer...	N.	101.6	90	....	....	....	....	....	....	....	....	★	....	....
16	J.M.	Farmer....	W.	101.2	100	....	....	★	★	....	....	....	★	★	....	....
17	H.P.	Farmer....	W.	103.4	90	★	★	....	★	★	★	....	....	....	....	....
18	H.S.	Farmer....	W.	102.	94	....	....	★	★	....	★	....	★	....	....	....
19	J.M.	Miner.....	W.	103.8	132	....	★	★	★	....	....	....	....	....	....	....
20	J.P.	Machinist.	W.	102.4	108	....	★	★	★	....	....	....	★	....	....	★
21	W.W.	Laborer...	N.	104.	118	....	★	★	★	....	....	....	....	....	....	....
22	H.N.	Farmer....	W.	100.8	82	....	★	....	★	....	....	....	....	....	....	★
23	B.C.	Laborer..	N.	104.	95	★	★	....	....	....	....	★	....	....	....	....
24	F.G.	Farmer....	W.	104.6	112	★	....	....	....	★	....	....	....	★	★	....
25	S.B.	Farmer....	W.	101.8	94	★	★	....	★	....	....	....	....	★	....	....
26	C.O.	Baker.....	W.	102.2	96	★	★	★	★	....	....	....	....	★	....	....
27	J.W.	Clerk.....	W.	102.6	84	★	★	★	★	....	....	....	....	★	....	....
28	W.B.	Farmer....	W.	100.2	80	★	★	★	★	★	....	....	....	★	....	....
29	O.W.	Farmer....	W.	103.6	90	....	....	★	★	....	★	....	....	★	....	....
30	W.B.	Laborer...	W.	102.	92	★	....	★	....	....	★	★	★	★	....	★
31	J.M.	Laborer...	N.	103.	96	★	....	★	★	★	....	....	....	★	....	....
32	N.J.	Laborer...	N.	101.2	96	....	....	★	★	....	....	....	....	★	....	....
33	A.R.	Farmer....	W.	101.2	88	....	....	....	★	....	....	★	....	....	....	....
34	C.N.	Farmer....	W.	102.4	96	....	....	....	....	....	....	....	....	....	....	....
35	J.V.	Farmer....	W.	102.2	106	★	★	....	★	....	....	★	....	★	....	....
36	C.T.	Teacher...	W.	100.6	88	....	....	★	★	....	....	....	★	....	....	....
37	A.S.	Cashier....	W.	102.6	92	....	....	....	★	....	....	....	★	....	....	....
38	F.D.	Farmer....	W.	101.4	92	....	....	....	★	....	....	....	★	....	....	★
39	L.C.	Farmer....	W.	102.	99	★	★	....	★	....	....	★	....	....	....	....
40	J.M.	Farmer....	W.	103.8	100	....	★	★	★	....	....	....	....	★	....	....
41	O.S.	Farmer....	W.	101.4	96	★	★	★	★	....	....	....	....	....	....	....
42	H.R.	Miner.....	W.	102.4	112	....	....	★	★	★	....	★	....	....	....	....
43	O.M.	Carpenter.	W.	103.	100	★	....	....	★	....	....	★	....	....	....	....
44	H.H.	Clerk.....	W.	103.	108	★	★	....	★	....	....	....	....	....	....	....
45	F.M.	Grocer....	W.	100.2	96	★	★	....	★	....	....	....	....	....	....	....
46	J.S.	Laborer...	W.	103.2	120	★	★	....	★	....	....	....	....	....	....	....
47	C.D.	Farmer....	W.	103.2	94	....	★	....	★	....	....	★	....	....	....	....
48	D.F.	Cook.....	W.	100.2	76	★	★	....	★	....	....	....	....	....	....	....
49	B.O.	Nurse.....	W.	101.2	84	★	★	....	★	....	....	★	....	....	....	....
50	T.S.	Nurse.....	W.	100.8	82	★	★	....	★	....	★	★	★	....	....	....
51	J.M.	Nurse.....	W.	102.	96	....	★	★	★	....	....	★	★	....	....	....
52	L.N.	Civilian...	W.	101.4	90	★	★	★	....	....	....	....	★	....	....	....
53	M.L.	Carpenter.	W.	102.4	98	★	★	★	....	★	....	★	....	....	....	....
54	T.L.	Machinist.	W.	99.6	96	....	★	★	....	★	★	....	★	....	....	....
55	S.S.	Laborer...	N.	102.	100	★	....	★	....	....	★	★	....	....	....	★
56	O.P.	Farmer....	I.	101.2	96	....	★	....	....	....	★	★	★	....	....	....
57	S.O.	Farmer....	W.	100.6	90	....	★	★	....	....	....	★	....	....	....	....
58	W.V.	Clerk.....	W.	101.2	94	★	★	....	....	....	★	★	★	....	....	....
59	T.S.	Surgeon...	W.	100.8	94	....	....	★	★	....	★	★	★	....	....	....
60	M.L.	Surgeon...	W.	101.6	90	★	....	★	★	....	★	★	....	....	....	....

Black star in table used to indicate symptoms or conditions present.
Case No. 20—Nose broken during boxing some years ago.
Case No. 30—Nose
Case No. 37—Hooky

NSET)				EPISTAXIS													
											Amount			Character Coagulatio		
Nausea	Conjunctivitis	Sore Throat	Backache	Previous Epistaxis	Bleeder	Injury to face	Diphtheria	Exanthemata	Typhoid	Previous Serology	Slight	Moderate	Profuse	Recurrence	Prompt	Fair
		★	★									★		1	★	
		★						★				★		1		★
				★								★			★	
		★						★					★	2		
													★			
							★		★	★		★		3		★
												★			★	
		★											★	1		★
												★			★	
				★				★					★			
★	★	★		★				★					★	2	★	
★				★									★	1	★	
				★	★								★	1	★	
			★	★				★	★			★		2	★	
				★				★		★			★	5	★	
			★	★								★		1	★	
★	★						★			★			★	2	★	
	★		★									★			★	
													★	3	★	
			★			★							★	2		
													★	4		
						★							★	5		
		★										★		2	★	
★				★	★		★			★			★	8	★	
				★				★					★		★	
				★									★	8	★	
				★				★			★				★	
★				★									★		★	
	★			★								★		6	★	
	★	★	★	★		★	★		★	★			★		★	
★				★									★		★	
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		★									★				★	
								★							★	
		★		★				★		★		★		3	★	
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			★										★		★	
			★						★				★	3	★	
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		★							★			★		2	★	
				★				★					★	3	★	
								★				★			★	
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		★										★			★	
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		★									★				★	
		★										★		2	★	
	★	★	★										★	1	★	
		★	★				★			★		★			★	
★		★										★			★	
★	★		★					★					★			★
	★	★				★						★		2		★
	★	★	★										★	1	★	
	★	★	★									★			★	
	★	★	★									★			★	
	★	★	★									★			★	

ns present.
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Case No. 30—Nose broken from fall in childhood.
Case No. 37—Hookworm in 1912.

Recurrence	Character of Coagulation: Prompt	Character of Coagulation: Fair	Character of Coagulation: Slow	Location: Septum	Location: Turbinate	Location: Nasal Floor	General Observations	Bacteriological Findings	Final Disposition: Pneumonia Ward	Final Disposition: Convalescent Ward	Final Disposition: Quarters	Final Disposition: Duty	Duration of Illness
1	★			★			Mild flu			★			3 da.
1		★		★			Otitis hemorrh.; flu					★	5 da.
	★			★			Developed pneumonia		★		★		3 wks.
2			★	★			Developed br. pneum.		★		★		4 wks.
			★	★			Developed br. pneum.		★		★		3 wks.
3		★		★			Mild flu			★			5 da.
	★						Mild flu				★		3 da.
1		★		★			Severe flu			★			5 da.
	★			★			Developed lob. pneum.		★		★		3 wks.
			★	★		★	Developed br. pneum.		★		★		2 wks.
2	★			★			Developed lob. pneum.		★		★		3 wks.
1	★			★			Developed lob. pneum.;		★		★		3 wks.
1	★						Developed lob. pneum.;		★		★		4 wks.
2	★						Severe flu					★	2 wks.
5	★			★			Daily epistaxis.; flu					★	18 da.
1	★			★			Lob. pneumonia					★	27 da.
2	★			★			Lob. pneumonia					★	3 wks.
	★						Mild flu					★	12 da.
3	★			★			Mild flu	Hem. strep. found				★	6 da.
2			★	★			Mild flu					★	10 da.
4			★	★			Severe flu	Hem. strep. found				★	2 wks.
5			★	★			Mild flu					★	12 da.
2	★			★			Severe flu					★	6 da.
8	★			★	Both	sides	Mild flu					★	8 da.
	★			★	Both	sides	Severe flu	Hem. strep. found				★	14 da.
8	★			★	Both	sides	Mod. flu					★	8 da.
	★			★			Mod. flu					★	13 da.
	★			★			Mild flu					★	5 da.
6	★			★			Severe flu					★	13 da.
	★			★			Mod. flu					★	6 da.
	★			★	Both	sides	Mild flu					★	8 da.
	★			★			Mod. flu					★	9 da.
	★			★			Mild flu					★	4 da.
3	★			★			Mod. flu					★	6 da.
	★			★			Mod. flu					★	9 da.
	★			★			Mild flu					★	9 da.
3	★			★	Both	sides	Mod. flu					★	10 da.
	★			★			Mild flu					★	6 da.
2	★			★			Mod. flu					★	9 da.
3	★			★			Mild flu					★	8 da.
	★			★			Mild flu					★	10 da.
	★			★			Mod. flu	Hem. strep. found				★	9 da.
	★			★			Severe flu					★	12 da.
2		★		★			Mod. flu	Hem. strep. found				★	15 da.
	★			★			Mild flu					★	7 da.
	★			★			Mild flu	Hem. strep. found				★	11 da.
	★			★			Mild flu					★	11 da.
2	★			★			Mild flu	Hem. strep. found				★	10 da.
2	★			★			Bronch. pneum.	Hem. strep. found	★		★		3 wks.
	★			★			Bronch. pneum.	Hem. strep. found	★		★		4 wks.
1	★			★			Severe flu	Hem. strep. found	★			★	15 da.
	★			★			Mod. flu					★	6 da.
	★			★			Severe flu					★	12 da.
		★		★			Mod. flu					★	6 da.
2		★		★	Both	sides	Bronch. pneum.		★		★		3 wks.
1	★			★			Mod. flu					★	7 da.
	★			★			Mod. flu					★	8 da.
	★			★			Mild flu	Hem. strep. found				★	6 da.
	★			★	Both	sides	Mod. flu	Hem. strep. found				★	9 da.
	★			★			Severe flu	Hem. strep. found			★		10 da.

tions and conclusions that we might reach from the observations here reported are quite corroborative of this.

There have been many hypotheses and theories developed, but no tangible and absolute conclusions reached. The endothelial lining of the body is a protective mucosa. Hemolysis is created by the presence of the streptococcus hemolyticus. Wherever hemolysis in this mucous lining tract occurs there is a break in the continuity of these protective surfaces and a possible entrance for any form of aerobic micro-organism. These observations may throw but little light on the specific micro-organism or combination of micro-organisms that has actually made of this "Flu" epidemic one of the most violent forms of infection of the respiratory tract in this country, but it may offer some tangible evidence as to the character, course and form of invasion, by which such micro-organisms or combination of micro-organisms have attacked the lungs with such direful and destructive results.

In a survey of the accompanying detailed table a number of interesting features are in evidence. In cases numbered 19, 21, 25, 44, 46, 48, 49, 50, 51, 58, 59, and 60 streptococcus hemolyticus was found in the culture made from the blood taken during epistaxis. In Case 2 the same micro-organism was found in the hemorrhagic bleb from the ear.

With but few exceptions the nasal hemorrhage in each case ceased with normal promptness. In many the bleeding stopped spontaneously without any mechanical aids, but in cases numbered 3, 6, 8, 12, 14, 29, 34, 37, 40, 42, and 55 the nose was packed with gauze. In Cases 6, 8, 12, and 34 there was recurrence of epistaxis in from fifteen minutes to twenty-four hours notwithstanding the nasal pack. In Cases 4, 12, and 24 a second injection of ten cc. normal sterile horse serum was used.

It will be further noted that in all cases giving a history of previous epistaxis the hemorrhage during this influenza period was profuse.

In no instance had any of this selected series of sixty cases developed pneumonia at the time of their admission as far as could be clinically determined. All sixty cases showed the presence of streptococcus hemolyticus or of bacillus influenza, either in the blood culture from the nasal hemorrhage or from the swabs taken from the throat. Thirteen (13) of these cases developed pneumonia following influenza infection. Five of these thirteen cases showed the presence of pure blood mixed with

the expectoration coughed up from the deeper respiratory tract. This pure blood-mixed sputum was noted within twenty-four to thirty-six hours after the onset of symptoms and indicates, in my opinion, a process of hemolysis in the larynx, trachea or larger bronchi.

The severity of epistaxis does not seem to be an index of the severity of the infection, as many of these cases in which nasal hemorrhage was profuse developed mild types of influenza, and several of the cases in which epistaxis was moderate in amount developed serious and protracted pneumonia.

In conclusion let me emphasize these facts: (1) that each of these sixty cases was injected with ten cc. of horse serum as soon as the onset was reported; (2) that epistaxis occurred in each case as one of the symptoms of onset during the epidemic; (3) that bacteriological findings in each case corroborated the diagnosis of epidemic influenza; (4) that the entire series of sixty cases have been traced to their final dispostion and that all have recovered.

3858 Westminster Place.

THE USE OF THE PITCH RANGE AUDIOMETER IN OTOLOGY.

DR. S. W. DEAN and C. C. BUNCH, Iowa City, Iowa.

Two years ago I decided that the methods of testing the tonal ranges used in our clinic, must be improved upon. It seemed to me that this could best be done by making practical application of facts already known to psychologists and physicists.

When I broached the matter to Prof. Seashore he suggested the appointment of a research assistant to work in otology and psychology, and to solve this problem if possible.

Mr. Bunch was appointed to fill this position. The instrument we now have is the result of his work.

The problem was to create an instrument that would measure the practical tonal range without skipping a note. It was desired to make it so that it would be a standardized instrument and at the same time be capable of doing the work accurately, and in a short period of time.

The instrument as we have it today is not a perfected machine. Its use is, however, far superior to any other method we have used in our clinic for measuring the practical tonal range. It has already suggested many new diagnostic points. As perimetry has developed ophthalmology, so may this method and other similar ones develop otology.

It is even conceivable that the exact determination of the interference with function in every note may result in lesions that are now classed as one disease, being separated into several distinct clinical entities.

In our clinic it has already replaced the tuning forks for testing the practical tonal range. Not only is it exact and in full detail, but it is a great time saver.

This report is made to show the work done and some results up to date. Our work is far from being complete.

A detailed description of this machine was submitted by Professor Seashore to the Psychological Division of the National Research Council. The instrument was used during the war to test men for radio service. In this work many unsuspected

defective individuals were found who had passed the other regular examinations for hearing.

The pitch range audiometer as we have it today, measures the tonal range from 30 double vibrations to 10,000 double vibrations; that is, the practical range of hearing.

The instrument has today in our clinic, three distinct practical advantages:

I. It measures the practical tonal range in much less time than can be done with the tuning forks.

II. It tests every note in the range measured while the forks test only a very few.

III. In 25 per cent. of our cases in the clinic, defects unsuspected after an examination with the Bezold forks, covering

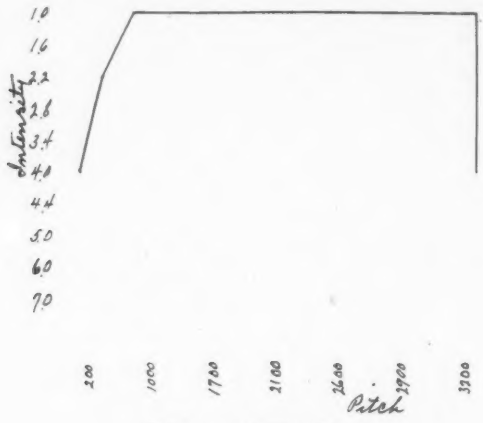


Chart I. Normal Ear.

over an hour, are detected in two or three minutes with this instrument. A tone gap, partial or complete, of three or four notes only, lying in an area between the tuning forks, never suspected to exist, will be definitely demonstrated by this instrument. These gaps, unsuspected in the clinical examination, have been immediately discovered in many cases. The findings have been confirmed with the monochord and sometimes with the forks, or on the piano.

The examination of chronic non-suppurative forms of ear lesions confirms the observation recently made by Emerson that involvement of the nervus cochlearis is very commonly associated with them.

The question of determining the high and low limits has not entered our problem. The low limit has been definitely proven by Professor Seashore to be 12 double vibrations. The high limit is not known. In determining it the question of intensity will play a very important role. In our cases, the high limits determined with the Galton whistle are hundreds of vibrations lower than when the Koenig cylinders are used—the Koenig cylinders have much greater intensity. It is not correct to say, after having determined the high limit with a Galton whistle, that the high limit is so and so, but only it is so and so for this particular whistle.

The instrument is an excellent one for rapidly and accurately determining malingering. In individuals deaf in one ear, we

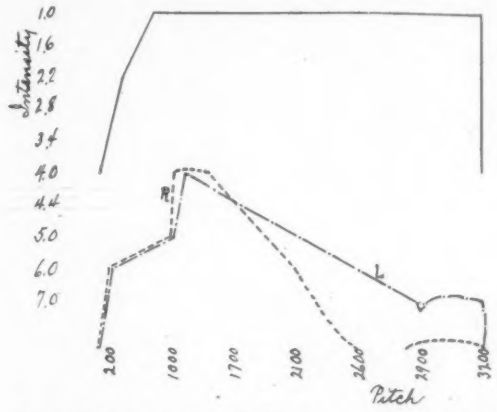


Chart II. Adhesive Catarrh of Middle Ear. Labyrinthine Lesion.

have found a constant definite cutting down of the apparent hearing in the deaf ear if the alarm apparatus is not used. With the alarm apparatus in the good ear, there is no sound perceived with the piece to the deaf ear. An individual claiming partial deafness in one ear would be detected because the curves representing the hearing in that ear, if the other were normal, would not be influenced by any great diminution of hearing in the ear, but would be the normal curve for a normal ear on one side and totally deaf ear on the other side. Curves made on successive days should be identical unless the ear condition is changing or the patient is malingering.

In testing the hearing of one ear it is always necessary to use a noise apparatus.

In measuring acuity for diagnostic purposes in otology or for practical purposes for determining the efficiency of hearing, we encounter six basic demands upon the measuring instrument:

(1) That it shall produce each and every tone within the significant range of tonal hearing;

(2) That this tone shall be pure;

(3) That it shall present favorable control of intensity;

(4) That the pitch and intensity shall be measurable.

(5) That either the pitch or the intensity may be varied with the other kept constant;

(6) That it shall be capable of rapid operation to avoid fatigue for the observer and to save the time of the experimenter.

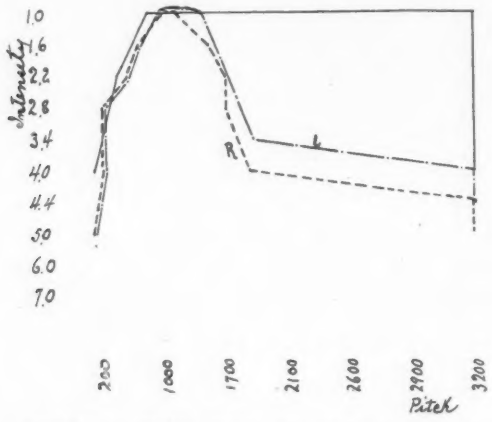


Chart III. Neuritis of Eighth Nerve Secondary to Chronic Tonsillitis. Before removal of tonsils.

The pitch range audiometer, fortunately, complies with these six requirements.

The following is a brief description of the instrument:

A more detailed description will appear soon.(Iowa Studies No. VIII).

If we take a magnet such as that used in a telephone receiver and attach to it another telephone receiver, and then lay a nail across the two prongs of the first receiver, we can hear a click in the other receiver when the nail is laid on and when it is taken off, as a result of the change in the electromotive force caused by bridging the two points of the magnet.

The nearest approach to this test up to the present time is that given by means of the Bezold forks, or some other similar set of forks. The forks which belong to the so-called "improved continuous sound scale," were first presented in 1890 at the International Congress of Physicians at Berlin. The "scale" consists of ten forks with movable weights, together with three whistles. These instruments are capable of producing all the tones in the hearing range. But the quantitative measurement with such a set of forks is very difficult. Bezold admits that "the examination of all ear patients with all sounds of the scale, as described, cannot be carried out, if, for no other reason than because of the loss of time," but he inserts the reservation

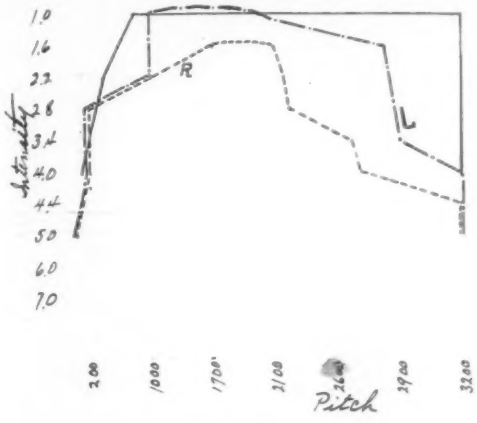


Chart IV.

that "it is, however, absolutely necessary in the examination of all pupils of deaf-mute institutions," and also, "the examination with the whole scale is necessary for the establishment of complete deafness in one or both ears."

The inaccuracy of our standards in determining the hearing power is so well recognized as to hardly need mentioning. One man determines the power of hearing the fork by striking it on his knee, another uses a rubber hammer and a third uses his fingers, etc. One may find the tuning fork is not heard. One using a method of giving a note of greater intensity reports that the note is heard. With the tuning forks the intensity diminishes much more rapidly just after the fork is struck than later. The high forks diminish in intensity much more rapidly than

low ones, so that the time element on tuning fork determinations as ordinarily done, is not in any way exact.

Professor Seashore has obviated this difficulty with the lower forks by having them electrically driven, and expressing the power of hearing in the distance at which the forks with constant intensity are heard. The higher forks, however, cannot be so driven. The apparatus needs constant skilled attention. The examination is time consuming and very fatiguing to the patient. The defect common to all tuning fork examinations of testing only a few notes is present.

The results obtained by this machine may be compared to perimetry of the eye; it is just as exact and just as complete. As

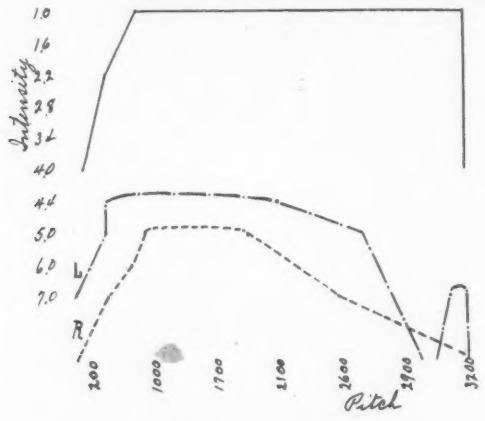


Chart V. Otosclerosis.

it is used more it will surely be found that certain curves are suggestive at least of certain lesions. Already we have had otosclerosis undiagnosed, distinctly suggested in several cases with this instrument.

The steps regulating intensity can be varied at will and kept constant. All the notes in the tonal range can be tested with the same steps. The notes are relatively pure. This is corroborated in partial and complete tone gaps when the sound suddenly disappears and again reappears.

A machine like this once completely standardized would give the same results on the same patient with different instruments and with different observers in Europe and in America. This ideal instrument has not yet been secured.

Now if we mount this receiver magnet in front of a toothed wheel so that each prong of the magnet will fit snugly in front of one tooth of the wheel, then the wheel becomes a bridge as the nail was in our first illustration. The magnetic current completes a circuit from one cog to the other. Now, if the wheel is revolved slowly, the cogs gradually recede from their magnetic points until they reach the maximum gap, and then the next pair of cogs will gradually make the bridge as before.

The pitch of this tone may then be varied by varying the speed of the revolving wheel. The wheel is driven by a direct current motor so adjusted as to produce any desired speed within our needs by the mere change of the slide on the rheostat.

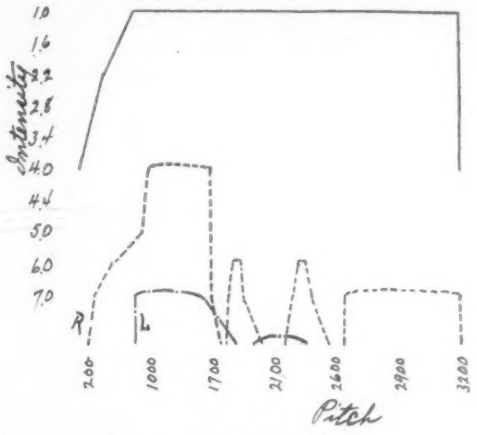


Chart VI. Concussion Deafness.

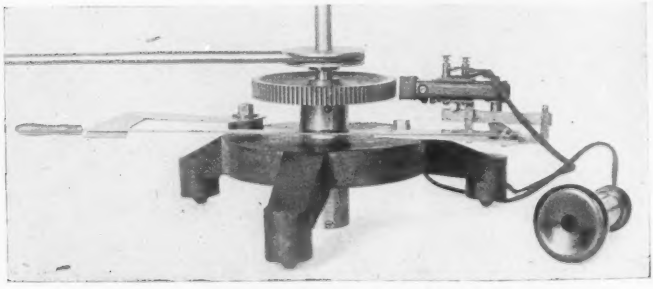
Thus, for example, when the motor is running very slowly, we have a corresponding low tone. By merely moving this slider along its scale we pass in a single sweep up to a very high tone as the wheel gradually speeds up.

There are two ways conveniently at hand for varying the intensity at a given pitch. One is to vary the distance of the magnet from the wheel, as is done by the lever in Fig. I. The other is by means of resistance in the telephone circuit, and here again we have two possibilities—we may either introduce the resistance in series with the magnets or we can use the resistance as a shunt, that is, a bridge across the receiver circuit.

thereby splitting the circuit. The latter method is the one we have finally adopted.

The pitch is measured in terms of the speed of the revolution of the wheel because one vibration is produced for the passing of each tooth. The electric tachometer offers a convenient

Pitch Range Audiometer—New Model.



Pitch Range Audiometer—Old Model.

method for securing this measurement and is in use at the present.

This very simple contrivance then embodies the essentials of our apparatus, but we were compelled to discard it because

it was impossible to secure soft iron of sufficient uniformity, in magnetic qualities to guarantee a smooth tone. To overcome this difficulty, at the suggestion of Professor Ford, we have adopted the plan formerly tried out in commercial motors of having as many magnets as there are teeth on the wheel, in order that we may get the cumulative result from all the magnets at the passing of each tooth.

In Fig. II, the final model, we see two sets of teeth. The upper one corresponds to our cog wheel; the lower one corresponds to our telephone magnet. In this lower one, each tooth is a pole, being made a series of magnets by passing an electric current through a coil of wire lying inside of the teeth.

The procedure in conducting the tests is very simple. The noise of the machinery may be eliminated by placing the motor in some distant room and having electric control for the experimenter who is seated in a quiet room with the patient. The patient holds the receiver to his ear and indicates by some noiseless method that he hears the tones. After giving the patient such instructions as are necessary, the experimenter is free for the manipulation of the apparatus had recording the results. He begins by throwing in the shunt a certain resistance which will give a strong tone in the receiver. The motor is then slowly speeded up until the entire tonal range is covered. Frequent control trials should be interspersed, periods at which the current is shut off from the telephone. This accomplishes two purposes. It keeps the attention of the patient at a maximum, and it secures the quick responses necessary for the exact location of short gaps. Now if there are any tones which are inaudible at this intensity, the patient will so indicate it. The point where he first indicated that he heard the sound, points where the sound became either audible or inaudible, and the point where he ceases to hear at the higher limit. If such point exists, all are recorded. Results are most descriptive when arranged in the fork of a graph. A convenient method of marking the graph is to have the intensity steps for the vertical scale and the frequencies recorded at the bottom as a horizontal scale.

The tones at this intensity having been observed and recorded, the experimenter sets the resistance at the next fainter step and the procedure is repeated. It is seldom necessary to repeat at any step except to find the exact location of gaps, since each succeeding fainter trial offers a check on all the trials which preceded. Any indication of ability to hear a faint sound where

before a louder sound had been inaudible indicates a lack of close observation or carelessness in recording results.

Danger of fatigue is largely eliminated because the pitch of the tone is constantly changing and, moreover, the entire test should not require more than fifteen or twenty minutes.

Returning to the requirements of an instrument like the pitch range audiometer, let us check up and see what is accomplished in this new instrument.

(1) It produces each and every tone within the significant range of tonal hearing without any gap whatsoever.

(2) It produces a relatively pure tone, pure enough for all practical purposes; and we have at our command the mechanical principles which determine the form of the sound wave.

(3) It furnishes us a convenient method of varying the intensity from below the threshold up to a sound that is on the verge of being painful for any pitch.

(4) It enables us to record and measure instantly and with precision and at the time of hearing both the pitch and the intensity of the tone.

(5) It enables us to sweep through the entire range of pitches at one stroke for any steps controlling intensity and to sweep through at a single stroke all the intensities for a given pitch.

(6) The operation of the instrument is so simple and quick that a complete measurement can be made in a very small fraction of the time employed in making the ordinary tests now in vogue with otologists.

SUBMUCOUS CORRECTION OF THE NASAL SEPTUM.

Dr. John A. Cavanaugh, Chicago.

Since describing my submucous operation on the nasal septum, before the Illinois State Medical Society, 1917, I have performed many more operations by the same method, and feel that it is the one to choose.

I will not discuss other operative procedures, but will limit myself to a description of my operation. The method of anaesthesia will rest with the operator.

The incision (Fig. 1) is made on the side of the deflection or convexity, just posterior to the mucocutaneous junction, carrying it from above downward through the mucous membrane to the cartilage and bony portion below and onto the floor of the nasal cavity. This incision can be varied to suit the individual case, but up to the present I have not found it necessary. Having made the incision elevate the mucous membrane with an elevator (Fig. 3), back to the ethmoid plate and down to the apex of the ridge if one be present. If the ridge be absent carry the elevation of the mucous membrane down to the floor. Should a thickening be present opposite the anterior end of the middle turbinate, elevate the mucous membrane over it.

The cartilage now being bare on the convex side, I pass my cartilage shave (Fig. 13A) through the incision and back to the ethmoid plate (Fig. 4), then making pressure toward the cartilage and drawing the instrument forward along the lower part of the cartilage to the initial incision, and I find a narrow strip of cartilage removed (Fig. 5), leaving the perichondrium of the mucous membrane of the opposite side exposed, where this small strip was removed.

Should the obstruction be due to the deflection of the cartilage, introduce the septum shave in a like manner (Fig. 6) beyond the bulging area and make a similar groove through the bulging center parallel with the initial groove. If the perpendicular plate of the ethmoid has shared in this deflection, I elevate the mucous membrane from the ethmoid plate beyond the deflected area; then introduce my septum forceps (Fig. 13B), of which the inner surface of one blade is roughened and the other smooth. The roughened blade is introduced into the nostril in which the

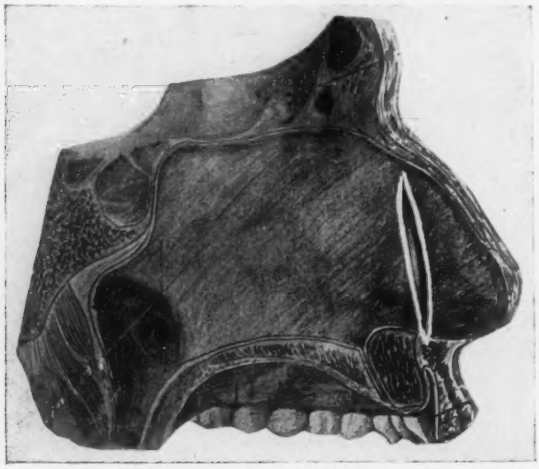


Fig. I. Incision made on convex side anterior to ridge or deflection.

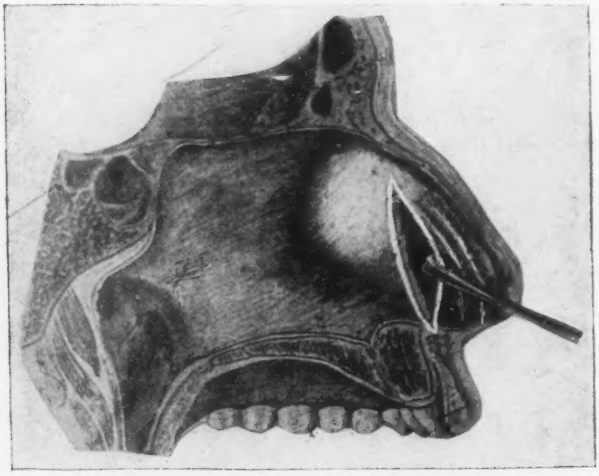


Fig. II. Elevating mucous membrane forward when bulging of cartilage extends anterior to incision.

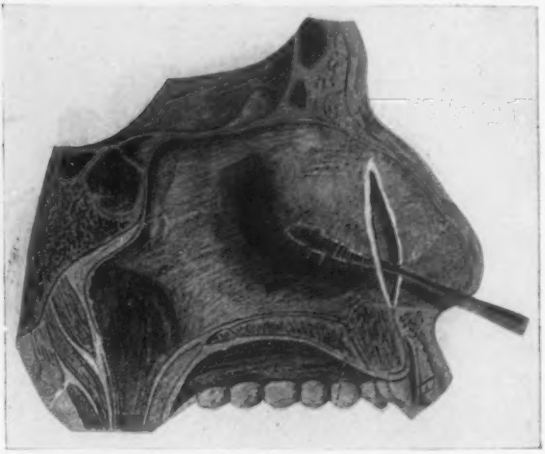


Fig. III. Elevating mucous membrane backward on convex side.

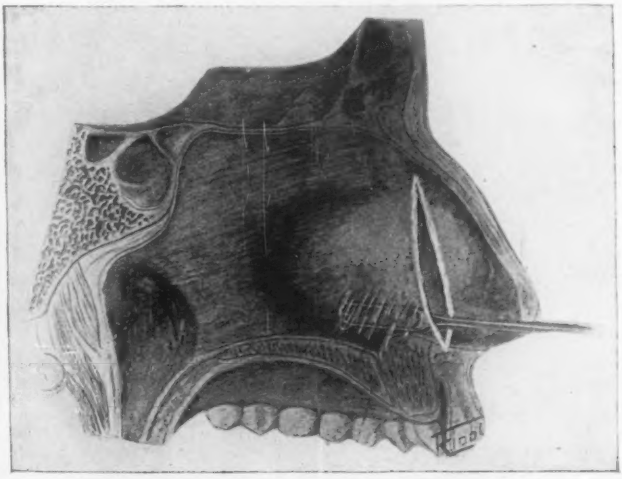


Fig. IV. Septum shave introduced between membrane and cartilage, back to perpendicular plate of the ethmoid and at lower edge of the cartilage.

Fig. V. Septum shave having been pressed against the cartilage and drawn forward, removes a small strip of cartilage and exposes perichondrium of opposite membrane.

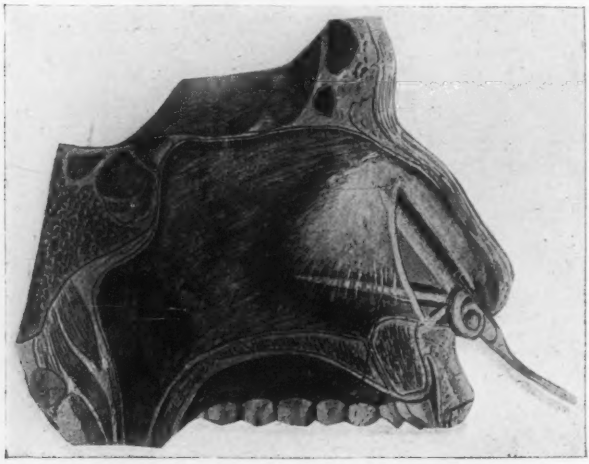


Fig. VI. Removing strip of cartilage parallel to nasal bones when bulging of cartilage is well anterior.

mucous membrane has been elevated and through the incision, so as to rest upon the exposed bony ethmoid plate, while the other blade, which is smooth, rests upon the mucous membrane of the opposite nostril. In this way the ethmoid plate can be fractured in several places (Fig. 9), then this portion of the septum can be freely and easily pushed into the position desired.

Where a ridge is present I proceed as before, removing a narrow strip of cartilage with my septum shave (Fig. 5) from the upper surface of the ridge. Most of these ridges are due to the displaced lower edge of the quadrilateral cartilage; this strip of cartilage left below my septum groove (Fig. 10B) is loosely attached to the perichondrium and easily removed. Should the bone partake in this ridge, I make an incision through the periosteum (Fig. 11B) on the upper border of the vomar after having removed the strip of cartilage (Fig. 10B) and then elevate the mucous membrane from the lower surface of the bony ridge (Fig. 12), which can now be done much easier, and without the danger of tearing the mucous membrane. I now introduce the septum gauge (Fig. 13C) and remove the bony ridge (Fig. 11C).

The thickened tuberculum septi can in some cases be shaven down (Fig. 8), if the septum shave can be introduced above it. When the tubercle is bony, or when I am unable to pass my septum shave above it, I shave off a little of the cartilage below the tubercle (Fig. 7A) and use the blunt double edged knife (Fig. 13D) to elevate the mucous membrane on the opposite side and make an antero-posterior incision through the cartilage (Fig. 7B); I then introduce a biting forceps to remove the thickened area.

If only a spur be present, make a vertical incision just anterior to the beginning of the elevation of the spur, then elevate the mucous membrane to the tip of the spur anterior, above and below, and with a blunt right angle elevator, elevate behind the spur to the tip and then cut off the cartilaginous tip, leaving the tip attached to the mucous membrane. Placing the septum gauge just anterior to the elevated portion of the spur, an assistant with a mallet drives it back, elevating the mucous membrane of the opposite side and at the same time removing the spur. As the gauge is driven back it should be held parallel to the mucous membrane of the opposite side.

Stitches can be introduced to bring the cut edges together if one so desires.

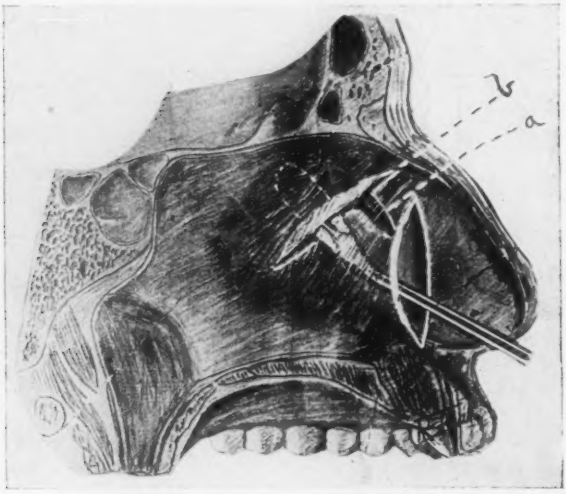


Fig. VII. Thickening of tubercle. (a) Groove made with septum shave through cartilage. Septum knife introduced at this opening elevating membrane on opposite side of tubercle and drawing knife forward and backward cuts cartilage. (b) Bite out thickened area.

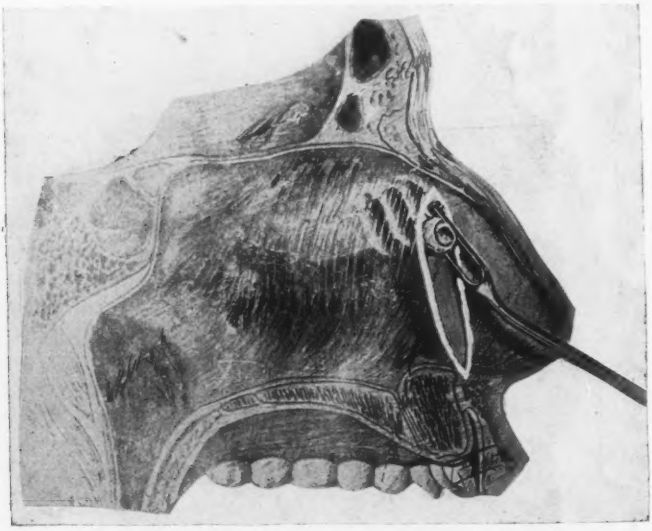


Fig. VIII. When tubercle is cartilaginous it may be shaven off.

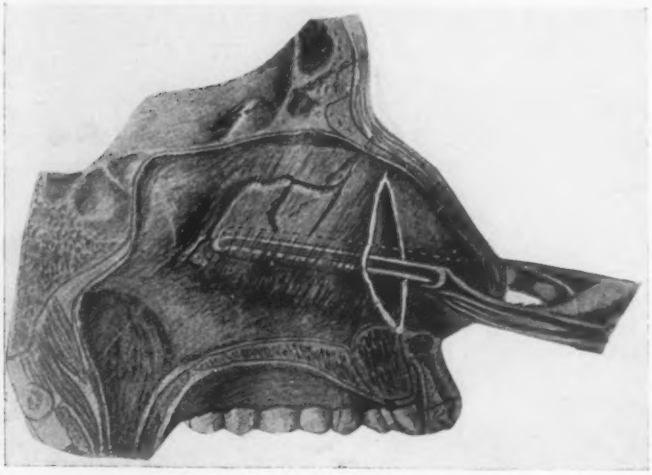


Fig. IX. Fracturing bony area of deflection with bone forceps.

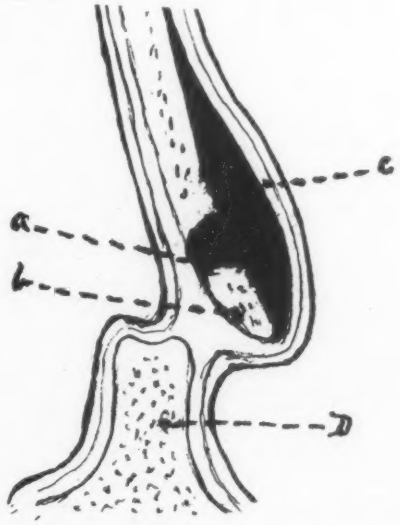


Fig. X. A—Groove made by septum shave. B—Lower end of cartilage. C—Elevated mucous membrane. D—Vomer.

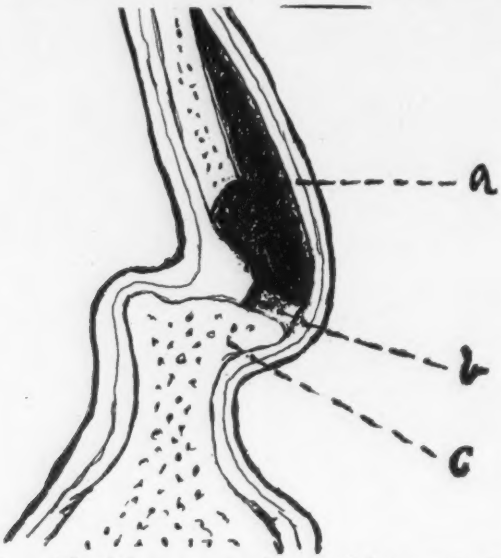


Fig. XI. A—Elevated mucous membrane and lower part of cartilage removed. B—Incision through perichondrium and periostium to vomer. C—Exostosis of vomar.

Fig. XII. Mucous membrane elevated over exostosis of vomer.

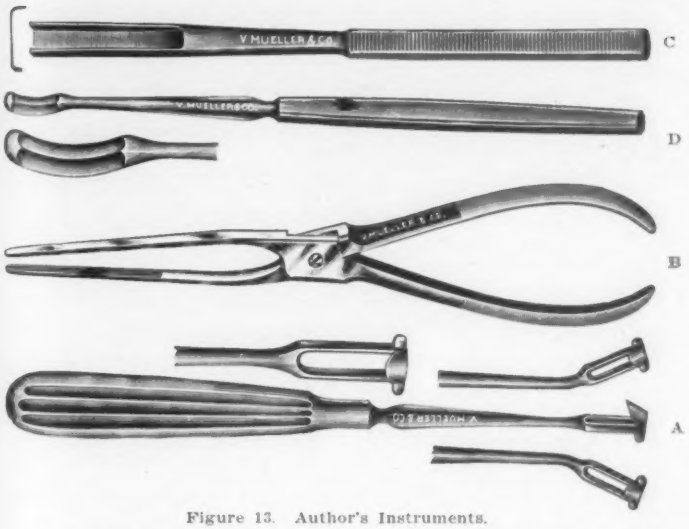


Figure 13. Author's Instruments.

A. Septum shave; B. Septum bone forceps; C. Septum gouge; D. Blunt end double edge knife.

I pack on the side that the mucous membrane has been elevated, with a rubber tissue, cut about the size and shape of the septum and spread over the mucous membrane surface, holding it in place with absorbent cotton which has been soaked in a weak iodine solution. This I allow to remain 24 hours.

I have performed about one hundred operations using this method, with excellent results and with no perforations.

I have operated with good results two cases, which were previously operated by the Ash method and in which the usual submucous operation would have been impossible.

In conclusion let me say the advantages of the operation are many.

It is easily performed.

Accomplished in less time.

Practically impossible to have a perforation.

Impossible to have a sinking of the nose.

Flapping of membranes during respiration never occur.

Can be performed at any age.

Previous operations, as the Ash Gleasa and sawing, will not interfere with this procedure.

LIMITATIONS OF THE DIAGNOSTIC VALUE OF THE SKIAGRAM IN DISEASES OF THE NOSE AND EAR.*

DR. JOHN GUTTMAN, New York.

Skiagraphy as an important aid in diagnosis is undoubtedly one of the greatest achievements in modern medicine. Its importance as a diagnostic agent in diseases of the nose and ear has been recognized only within the last decade and a half. Like all other new discoveries in medicine, the great enthusiasm with which skiagraphy was originally received has of late been supplanted by a wave of pessimism, which must now be replaced by a judicious valuation of its real merits.

Skiagraphy in Diseases of the Accessory Sinuses.—A surgeon nowadays will hardly ever operate on the accessory sinuses without having first obtained and studied a skiagram of the sinuses. In former years diseases of the accessory sinuses were diagnosticated first, from the presence of subjective symptoms such as headache, kakosmia, mental depression, etc., etc., and second, from the objective findings such as detection of pus in the middle meatus, in the olfactory region, or in the pharynx. The latter were determined by inspection, transillumination, probing, aspiration and exploratory irrigations of the sinuses. When the presence of pus had been determined by these means, it usually was difficult to decide whether one or several sinuses, and what is just as important, which of the sinuses was involved. By these methods, unless the symptoms and signs were clear-cut, a diagnosis could be reached only by a process of elimination, and in many cases the diagnosis was doubtful even then.

It was in these doubtful cases that the skiagram came to be of such great value. A good skiagram would enable one to determine at a glance, whether any sinus was diseased, and if so which sinus it was, and in this way the correctness or incorrectness of the previously made clinical diagnosis could at once be corroborated, thus removing all possible doubt as to the exact nature of the condition.

At times, our enthusiasm went too far, and we began to neglect our previous slow but methodical procedures of arriving at a diagnosis, and we began to make positive diagnosis by skiag-

*Read before the Section on Laryngology and Rhinology, New York Academy of Medicine, March 26, 1919.

raphy alone. When, however, the operative findings in some of these cases failed to prove the correctness of the skiagram the pendulum began to swing in the opposite direction, pessimism replacing enthusiasm—and the roentgenogram as a diagnostic aid began to be deprecated, and its value as such in some quarters even totally denied. Apropos of this, a report of the following cases may prove both illustrative and interesting:

R. K., a 24-year old girl, began to complain of headache and of a bad odor from her nose. Inspection showed a markedly deviated septum, so that the middle meatus did not lend itself readily to inspection. A skiagram showed marked cloudiness of the right antrum. A radical operation on the maxillary antrum showed it to be perfectly healthy; the mucous membrane was glistening white and of normal appearance. In spite of the fact that no further treatment of the nose or antrum was instituted, the patient's general condition was better; and three months later she reported that the bad odor had considerably diminished and her headaches greatly improved.

A similar experience was encountered in two other cases in which the patients complained of headache, and the objective symptoms with the exploratory "washing out" of the sinuses were doubtful. Skiagrams showed marked cloudiness of the maxillary and ethmoidal antra. On performing radical operations on the maxillary antra they were found to be perfectly dry and the maxillary sinuses normal.

Numerous similar experiences could be cited, from which it would be almost natural to draw conclusions that skiagraphy is misleading and without value in diagnosis of these conditions. The following case, however, will prove that to draw such absolute conclusions from some of the failures, would be just as erroneous.

L. L., 26 years old, had been suffering for six years from repeated "colds" in the head—mostly during the winter months. These so-called colds were accompanied with dryness in the nose and throat with a sensation of pressure in the head; on the mental side, there was lack of the power of concentration and slight defects of memory. The objective findings of the sinuses were not conclusive, irrigation of the antrum showed no pus. A skiagram, however, showed cloudiness in both maxillary sinuses and in the right ethmoidal sinus.

Notwithstanding the generally accepted opinion that because irrigation of the right maxillary sinus showed it to be free

from pus and therefore healthy, we relied on the x-ray findings and opened the antrum according to the Luc-Caldwell method. We found the sinus filled with greyish-white polyps which had already undergone fatty degeneration, and very little fluid pus. A radical removal of the diseased mucous membrane with the establishing of proper drainage and irrigation of the cavity for a few weeks, was followed by a disappearance of all the symptoms. After this operation the patient felt so well, that the *other* sinus, which appeared affected, was left untouched.

This case illustrates the diagnostic value that one may attach to the reading of a skiagram, and how some cases of migraine, hysteria or neurasthenia can be cleared up by the aid of a good skiagram.

Looking at this subject from every point of view an unbiased observer is led to express the following conclusions as regards the value of the skiagram in diseases of the accessory sinuses:

1. The skiagram will prove the presence or absence of a sinus.

2. It will show the form and size of a sinus.

3. A skiagram showing a clear sinus is an undoubted sign of a healthy, normal condition of that sinus.

4. The pathological condition of a sinus can be corroborated by a skiagram when the usual subjective and objective symptoms point in that direction, but the presence of a shadow alone without such subjective and objective symptoms, is not sufficient proof of the existence of such a pathological condition, nor is it in itself an indication for operative interference on that sinus.

Skiagraphy in Purulent Affections of the Middle Ear.—In many acute and chronic purulent affections of the middle ear, especially with symptoms pointing to a possible involvement of the mastoid bone, it may at times be difficult to decide upon the exact mode of therapeutic procedure. In a given case of purulent otitis media it may be of great importance both to the life of the patient as well as to the reputation of the otologist, to decide whether a mastoid operation is indicated, or whether the patient may recover without such an operation. Every diagnostic procedure, which can aid in the exact determination of the indications for operative interference, should therefore be utilized.

Anatomically, there is a great similarity between the accessory sinuses of the nose and the cells and the antrum of the

mastoid bone, the latter being practically an accessory sinus of the tympanic cavity.

In spite of the frequently encountered pitfalls, we are, as a rule, in diseases of the accessory sinuses, able to formulate the indications for operation, almost exclusively from the x-ray findings, but in diseases of the middle ear the skiagram is far from having the same diagnostic value. The reason for this becomes evident, when we consider that in the diagnosis of affections of the accessory sinuses a skiagram is of value mostly in chronic cases—a radical operation in acute cases being hardly ever indicated, but in mastoiditis the information, such as one can gain from the x-ray, is most desirable in acute affections. It is just in these latter cases where the question of the advisability of operative interference most commonly arises.

In almost every case of acute purulent otitis media, there is a coexisting involvement of the mastoid, to which the tenderness to pressure on the tip, and the antrum region of the mastoid is due. Unfortunately skiagraphic findings in these cases are of little or no diagnostic value. An x-ray in these cases will almost always show cloudiness of some cells, and sometimes of the antrum of the mastoid.

The differentiation of the different cavities of the middle ear, i. e., the tympanic cavity, the additus ad antrum and antrum is purely an artificial one. In the rabbit, for instance, the three cavities are merged into one large cavity. We must, therefore, as Dench says, "consider every case of middle ear inflammation in reality a case of mastoidtis, which, when drained by a free incision of the drum membrane, recovers spontaneously. If this drainage is insufficient a mastoid operation, which drains the middle ear through a posterior incision, is indicated."

The difference in appearance of the two symmetrical accessory sinuses is of great diagnostic importance. A cloudy, opaque appearance of an accessory sinus on one side is a clear indication for surgical intervention on *that* side. A difference in appearance of the skiagrams of the two mastoid bones, however, is not of much diagnostic significance, because when these are perfectly normal, they may appear differently on the skiagram, this difference being due to differences in the anatomical construction of the two mastoid bones, one of which may be pneumatic and the other sclerotic.

Thus we see that an x-ray showing cloudiness in the region of the antrum or of the other mastoid cells in a case of purulent

otitis media is not necessarily an indication for mastoidectomy. We often find such cases may become perfectly well without any operation, or when an operation is resorted to, with the exception perhaps of a few drops of pus or some hyperaemia in the mastoid cells, no other pathological conditions are found, and the probabilities are that the patient would have made a good recovery without a mastoidectomy.

The negative findings of a skiagram, however, are of value, because they show that the mastoid bone is not involved. The old and well established symptom complex which results from insufficient drainage is still the best indication for mastoidec-, tomy, when anterior drainage by myringotomy or trephining cannot be satisfactorily established.

From these remarks it does not necessarily follow that the skiagram is of no value in the diagnosis of diseases of the ear. In some doubtful cases it may be *the* deciding factor in the determination as to whether such symptoms as swelling in the region of the mastoid, drooping of the canal wall, pain, fever, etc., are caused by a furuncle or by a mastoiditis. The x-ray is also of value in some cases as an aid in the determination as to whether a lateral sinus has an abnormally bent course towards the tympanic cavity. There are various other doubtful cases in which the use of the x-ray might be of some value, but as a deciding factor in the indication for mastoidectomy, it is at the present time of very little value.

60 St. Mark's Place.

CORRECTION OF NASAL DEFORMITIES BY THE IMPLANTATION OF BONE; IMPROVED TECHNIQUE.

Dr. William Wesley Carter, New York City.

My object in bringing this patient before you is to direct your attention again to the importance of bone transplantation in the correction of nasal deformities and also to introduce what I believe to be a desirable modification in my original technique, with which you are all familiar.

This man, 28 years of age, gives no history of specific infection and has never been seriously sick in his life.

When he was 14 years of age he fell and striking on his nose, he fractured it badly. At the time of the injury strips of adhesive

plaster were placed across the nose, but he received no other treatment. The bridge of the nose became flat and nasal respiration was almost completely obstructed. In addition to this he suffered from headaches and a feeling of pressure between the eyes, and he was so embarrassed by his deformity that his success in business was interfered with.

Seven years ago a submucous operation was performed by another surgeon and an attempt was made to build up the cartilaginous bridge with the tissue removed, and apparently also by using a portion of the alae near their junction with the septum. The submucous operation improved the nasal respiration, but neither the deformity nor the symptoms of pressure were benefited.

When I saw the patient for the first time in June, 1918, examination revealed the following conditions: The nose was broad and flat and the junction of the bony and cartilaginous bridge was marked by a pronounced step-like deformity. On either side of the median line was a depression showing where portions of the alae had either been destroyed by the injury or removed at the time of the operation. On the right side the upper end of the nasal bone and the nasal process of the superior maxilla were fractured and displaced inwards. Intranasal examination revealed a perforated septum. On the right side the superior fossa was obliterated and the middle fossa greatly constricted by the protrusion inward of the nasal bone and nasal process of the superior maxilla. There were also synechiae between the middle turbinate and the septum.

First operation, June 27, 1918, under general anesthesia: The right nasal bone and nasal process of the superior maxilla were refractured and placed in their proper position, and the bases of both nasal processes were set nearer the median line after first liberating them by means of the chisel, thus narrowing to some extent the base of the nasal triangle. The parts were held in their proper position by means of a suitable splint until union occurred. The above procedures were designed to restore the several parts of the nose to their proper position and to prepare for the correction of the depressed deformity by the transplantation of bone. This operation was performed on Nov. 18, 1918, a split section of the ninth rib being introduced within the nose in the manner previously described by me. In addition to this I carried out the following procedure which, so far as I know, has not been done before. The idea was suggested by the fact that in this case there was a deficiency in the alar cartilages on either side of the median line, causing dis-

figuring depressions; also by the fact that in some of my transplantation cases I have noticed a slight depression on either side of the transplant, which it was very difficult to prevent, by shaping the bone. To correct this the cancellous tissue and the fine bone shavings, removed in preparing the transplant, were placed alongside the edges of the transplant and between the layers of the alae, which had been split over the areas corresponding to the depressions. I succeeded thus in filling in these irregularities and in rounding off the dorsum of the nose to a considerable extent. In my opinion this procedure added much to the success of the operation. Healing in this case took place just as rapidly and was as free from all complications as any that I have operated upon. The patient left the hospital six days after the operation. The deformity is corrected and the transplant is now firmly united to the frontal bone. His nasal passages are free and he is relieved of his headaches and of the symptoms of pressure between the eyes.

It is unnecessary to say that strict aseptic precautions must be observed in doing this operation. As to whether this cancellous tissue and the bone shavings have been absorbed or are living and producing new bone, is at present a matter of conjecture; the question is purely one of academic interest, and in either case does not affect the practical results of the operation, for if it is absorbed, connective tissue remains in its stead and answers our purpose. We know that cancellous tissue is particularly rich in osteoblasts and that small fragments of bone possess relatively greater osteogenetic powers than larger fragments, therefore we may safely assume that in this case bone formation will occur.

In regard to the main dorsal transplant, a sufficient time has elapsed in a number of my cases to show definitely what occurs, as some of these are of over ten years' standing. For obvious reasons we must rely upon physical examinations and radiographic observations made at frequent intervals. These show that the outer layers of the transplant which come in intimate contact with the circulation, remain alive and grow, the growth being regulated by the functional demands of the part; while in the center of the bone, which is relatively remote from the circulation, there is, owing to a lack of nutrition, a certain amount of absorption which appears in the radiogram as a thin line running along the center of the transplant and gives the impression of being a small medullary canal. These phenomena are presented in every case and have been studied by me in a selected case which I operated on about ten years ago. I believe that this case shows truthfully exactly what occurs when a physio-

logical transplant is introduced into the tissues of the nose in vital contact with the frontal bone. By physiological transplant I mean an autogenous, recently removed, periosteum-covered segment of bone. It is in vital contact with the frontal bone only when this has been cut into or chiseled into and the end of the transplant contacted at that point. Osteogenesis proceeds directly from the frontal bone itself; there is no osteogenetic layer to the so-called periosteum of the bones of the skull.

The value of the periosteum in bone transplantation is a question that has been ardently discussed and opinion still differs widely. In my earlier work, as you know, I used bare bone exclusively; my results were good and unquestionably the bone remained alive, but it did not exhibit the vitality one would expect and it seemed to remain under the tissues as a mechanical support and apparently did not share in the vital processes to the same degree as the surrounding tissues; this caused me to preserve the periosteum on the outer surface of my transplant. There was noticeable both clinically and radiographically a marked difference in favor of the periosteum-covered bone. It became more quickly attached to the frontal, it formed vital connections almost immediately with the surrounding tissues and its growth was more satisfactory. I have, therefore, abandoned the use of bare bone transplants.

My experience does not negative the assertion of MacEwen, that the periosteum is merely a fibrous limiting membrane. On the other hand it would seem to strengthen it; for we know that the surface of the bone under the periosteum is covered with osteoblasts and that many are found in the mouths of the Heversian canals. It would seem that the periosteum retains these in their normal positions and their function as bone producers is undisturbed by the removal of the transplant from one part of the body to another.

69 West 50th Street.

HISTORY OF AN OBSCURE CASE OF INTRACRANIAL INFECTION WITH AUTOPSY FINDINGS.*

Dr. Philip D. Kerrison, New York.

The following case is instructive in showing the occasional extreme penalty for delay in operating in a perfectly simple case of acute mastoiditis. It also illustrates the almost insuperable difficulties of diagnosis which may exist when the conflicting symptoms of one or more complicating lesions are present to obscure the clinical picture.

C. J., a man 40 years of age, first appeared at the Manhattan Eye and Ear Hospital as a clinic patient on October 25th, 1918. He was a powerful and apparently perfectly healthy man, weighing 210.

Aural History: He had suffered from pain, at times severe, in right ear for about a week. The drum membrane was red, infiltrated, bulging. Spontaneous rupture had not occurred. There was prononunced sensitiveness to pressure over antrum; slight tenderness over tip. He was advised to come into the hospital for observation and probable operation, but refused. A free incision in the drum membrane was, therefore, made and he was told to return regularly to the clinic for treatment.

During the week following, his ear seemed to be progressing favorably, i. e., there was only moderate discharge and the tenderness behind the ear was less marked. From this time he ceased coming to the clinic, and I did not see him again until November 28th, when he appeared at my office. His appearance and the local condition on this day were unusual. The right drum membrane was still infiltrated and discharging through a small perforation. There was no appreciable mastoid tenderness. On the right cheek was a prominent swelling extending from the temporal region downward well in front of the ear toward the angle of the jaw. The situation and appearance of this swelling was unlike anything I had previously seen in association with tympanic suppuration, and had I seen the patient then for the first time, I might have regarded the facial swelling as an intercurrent and wholly independent lesion. The patient was

*Read in part before the New York Academy of Medicine, Otological Section, on March 14th, 1919.

now thoroughly frightened and made no objection to coming to the hospital for immediate operation.

Operation, November 28th, one month and three days after an operation had first been proposed.

Removal of a thick cortex showed a large tip cell containing pus. Other than this, the most striking feature was the advanced necrosis in the chain of cells occupying a remarkably large zygomatic space. This space extended far forward and perforated the outer plate of the squama in front of the root of the zygoma. When this point was reached, pressure on the cheek caused the escape upward of approximately an ounce of pus. Into this abscess cavity a small opening was made from the cheek, hoping in this way to obviate the necessity of leaving too large an open wound above. This makeshift did not provide adequate drainage, and a week later it was necessary to re-open the wound in the temporal region and establish through and through drainage by means of a rubber tube passing from this situation through an enlarged opening in the cheek.

For a few days from this time, the patient's condition seemed satisfactory, but on December 11th, the temperature suddenly shot up to 103° F., and coincidently, characteristic signs of facial erysipelas appeared.

During the next two weeks, the patient's condition was in most respects typical; i. e., continuous high temperature, ranging for the most part between 103 and 105, sometimes dipping for a few hours to 101°. The erysipelatous swelling on his face was peculiarly severe, extending gradually and subsiding slowly. He complained a good deal of headache, and also of pains in the back and neck muscles. During the first two weeks of his erysipelas, I was somewhat concerned by a somewhat persistent bradycardia, the pulse going each day to 64, 62 and on two days being recorded as low as 52. Dr. Dwyer, whom I asked to see the patient with me on account of this symptom, said he has observed it in certain other cases of erysipelas eventuating in recovery. This statement largely relieved my anxiety as to a possible intracranial lesion.

From December 24, 1918, when I was taken down with pneumonia, I did not see the patient for many weeks, care of the case being assumed by Dr. Andres.

When I was able to resume my work, I learned that he had been discharged from the hospital on January 9, 1919, apparently in satisfactory condition, but with wound not yet healed.

On February 8th, when I saw him again, he showed in his face the loss in vitality incident to his exhausting illness, and an unsightly and imperfectly healed wound seemed to call peremptorily for a plastic operation.

He was re-admitted to the hospital on February 14th. His urine on this day showed a marked trace of albumen, numerous pus cells and course, granular casts. On the operating table he took the anaesthetic so badly, both as to heart action and respiration, that it was necessary to abandon the operation, and the patient was returned to the ward. My intention at the time was to devote the next few days to getting his kidneys into normal condition and then repeat the attempt to operate. But his general condition did not improve. On the day following he complained of sore throat, and had difficulty both in talking and swallowing. One day later, Dr. Farr saw him with me, and opened an abscess behind the right tonsil, evacuating a large amount of pus. During the next few days he was seen by many men, who regarded the abscess in the throat as the chief cause of his septic temperature curve and very poor general condition.

A specimen of blood taken on February 18th showed the presence of streptococci. But the swollen condition of the patient's throat at this time made the administration of an anaesthetic quite out of the question. He died rather suddenly on February 20th.

Autopsy Finding: The post-mortem examination showed a clot, apparently of rather recent formation, extending from near the torcular to a point near the jugular bulb. Free pus was found between the dura and the right lobe of the cerebellum, which also showed well marked cortical changes. These disintegrative changes in the cerebellar cortex had the appearance of being of longer duration than the clot in the sinus.

In mentally reviewing the clinical phenomena of this distressing case, it is clear that whatever was at some stage necessary to avert the fatal termination was not done. But at all times the picture was so obscured by the overlapping symptoms of complicating lesions that it is difficult, even in the retrospect, to see where an exploratory operation would have been justified by the indications present. Was a cerebellar lesion present during the height of the erysipelas? Was the sinus throbosis a late development, and was the retrotonsillar abscess a metastatic result or simply intercurrent? In the post-operative

period of a suppurative mastoiditis, with severe complicating erysipelas and high temperature, should a well marked and persistent bradycardia be regarded as justifying a surgical exploration of the brain? In general, I should say not, though it is possible that such intervention, which it would have been necessary to undertake during a period of continuous high temperature which the erysipelas seemed amply to explain, might have saved this patient. As adding one more intricacy to the diagnostic difficulties of this case, it may be said in conclusion that when the fever and other symptoms incident to the erysipelas subsided, the pulse rate also returned to normal, ranging between 80 and 86.

Bone and Cartilage Grafting in the Correction of External Deformities of the Nose. L. COHEN, *South. Med. Jour.*, 1919, xii, 151.

Cohen discusses various phases of bone and cartilage grafting in the correction of external deformities of the nose, adding 5 case reports with photographs of the patients before and after operation.

In regard to the question as to whether it is better to use bone or cartilage, the author lays down the sensible proposition that where bone existed formerly bone should be preferred, and where cartilage existed formerly cartilage should be used.

Rib transplant is preferred to tibial transplant because, in the author's experience, the latter has not grown fast to the underlying bone. The method in obtaining and placing the graft is as follows: "After exposing the seventh or eighth rib by the usual incision, a section 3 to ¼ in. wide and of the necessary length is taken from the center of the outer table down to the diploic structure with a sharp, narrow chisel, and a strip of cartilage slightly wider and thicker, from the adjoining costal cartilage, care being exercised not to break the connection betwen the two portions.

Cohen invariably retains a periosteal and perichondrial covering on the side of the transplant which is to come into contact with the skin. The subcutaneous method of placing the graft is preferred, i. e., through incisions within the vestibule of the nose.

IDIOPATHIC EPILEPSY FOUND TO BE DUE TO EMPYMEA OF THE ANTRUM OF HIGHMORE. OPERATION AND RECOVERY.

Dr. J. Clarence Keeler, Philadelphia, Pa.

Notwithstanding the fact that epilepsy has existed for centuries, it remains in the category of incurable diseases; its cause and its cure, undetermined.

In presenting this case before the Philadelphia Laryngological Society, I am prepared to show that the etiologic factor of epilepsy, in this particular instance, had been overlooked; that it was a condition due to focal infection, and not a case of idiopathic epilepsy. This shows the importance of searching thoroughly for all contributing causes.

During the past five years, this patient suffered frequent convulsions. The attacks becoming more frequent and more severe, he grew melancholy. There seemed no hope for improvement; no cure for his distressing affliction.

At this time, he was a soldier in the Regular Army and spent the greater part of his enlistment in the so-called "Nut Ward," being just another unfortunate who has "fits." Prior to the entrance of the United States in the World War, he was discharged from the service. But soldiering charmed him and he re-enlisted. By what means he received his commission, considering his physical condition, I am unable to comprehend. Nevertheless, he is now a private in our great military force.

I will briefly state his case:

Private E. P., age 34, admitted to the United States General Hospital No. 9, Lakewood, New Jersey, April, 1918.

The officer in charge of the Neurological Section diagnosed the case as one of "idiopathic epilepsy," and he was placed in the Neurological Ward. It soon became apparent his hearing was impaired, having only about one-third the normal power in the left ear. His gait was staggering; he had attacks of dizziness so great that he would fall, if not supported.

Immediately preceding a convulsion, he experienced queer feelings in his head (aura), and he observed that after a convulsion. there was a thick light-colored, offensive discharge from the nose, which seemed to relieve the head symptoms. Examination of the nose revealed a few drops of pus over the left inferior turbinate. If this were wiped away with a cotton-tipped applicator, a drop would soon reappear. Transillumination showed a dark shadow of the left superior maxillary sinus, and x-rays confirmed the diagnosis of empymea of the antrum.

Under local cocaine anesthesia, a trocar was introduced under the left inferior turbinate. The cavity was irrigated and a dark-green, foul-smelling pus was removed. Irrigation was continued daily for two weeks and the return flow became comparatively clear. His hearing and general health improved greatly. Irrigation was discontinued three or four days when he again became dizzy; his hearing again became impaired and he was apprehensive of another convulsion.

An operation was decided upon, or rather, a more radical one was found necessary. Under ether anesthesia, the so-called Caldwell-Luc operation was performed. His recovery was so rapid and complete that five weeks later he was en route to France to join his company.

Dermoid Cysts Lying Within the Floor of the Mouth. M. N. FEDERSPIEL, *Internat. Jour. Orthodont. and Oral Surg.*, 1919, v, 129.

Two cases are reported. According to Blair, dermoid tumors in the mouth occur either beneath the skin between the geniohyoglossus muscles or laterally below the angle of the jaw. In both of the author's cases the tumors had their origin between the geniohyoglossus muscles and were removed through a vertical incision extending from the chin to a little above the hyoid bone. In one case the teeth had been forced apart, but in the other there was no derangement of the dental alignment. During the operative procedure pressure was made upon the tongue and the tumor mass was forced through the separated muscles and easily removed by blunt dissection.

NASO-PHARYNGEAL CONDITIONS, TENDING TO PROLONG MENINGOCOCCUS CARRIAGE.

Dr. James W. Babcock, New York.

The occasional failure of the present chemical methods of disinfecting the carriers of meningococci led the Staff of the Rockefeller Institute to seek for a cause in the naso-pharyngeal conditions of the carriers. They accordingly called in Dr. Cornelius G. Coakley, who examined many of the men here reported and outlined the course of the investigation by the author.

Ten men from the Army and twenty-seven men from the Navy were examined, but of the latter only twelve were treated at the Rockefeller Institute for Medical Research. All of these men were stubbornly resistant to treatment given by the medical staffs of the hospitals from which they were transferred. The chemical treatment and bacteriological work were under the direction of Major H. L. Amoss. The necessary radiographic work was done by the kindness of the late Major Eugene W. Caldwell, and the operations were performed at the Rockefeller War Demonstration Hospital through the courtesy of Major George Stewart.

Reasoning from the facts found in the somewhat similar condition of diphtheria carriage by Friedberg,[1] the tonsils and adenoids were suspected as being the probable "dug-out" of the meningococci. This suspicion was strengthened by the findings of R. D. Herrold[2] in the distribution of meningococci in the upper respiratory tract of carriers. He found positive cultures of the naso-pharynx in 70.9 per cent. of carriers and in the tonsils in 31.2 per cent. In referring to the failure to eliminate meningococci from some carriers by chemical means, Gordon and Flack[3] state: "A probable explanation of this lack of success in the treatment of chronic carriers is either that all the surface area of the naso-pharyngeal mucous membrane carrying the meningococcus is not reached by the antiseptics, or that the meningococcus lurks in the depths of this mucous membrane as well as on its surface. However this may be, it is certain that the germ would readily be destroyed by even a comparitively feeble disinfectant, could the latter be got to it."

The apparently obvious deduction from these statements is that a condition in the naso-pharynx, where the organisms are most frequently found, which would have a mechanically protective effect from the antiseptic used, would be a frequent find-

ing in carriers. The table below shows that adenoids are very frequently present. Other factors such as suggested by Cleminson[4] are worthy of serious consideration such as (1) irregularities in the septum with contact with the lateral wall, making drainage poor and ingress of disinfectants difficult; (2) diseased tonsils, and (3) teeth, (4) diseased accessory sinuses which would hardly be affected by any spray or vapor.

He, Cleminson, finds that already existing sinus infection is unfavorable to the genesis of carriers; and one would suppose that the presence of other organisms would be unfavorable to the development of the meningococcus in vivo as well as in vitro. For that reason infected teeth, tonsils and sinuses would not be so strongly suspected as favoring the genesis of carriers. None of the secretion from any of the diseased sinuses treated in the cases below showed meningococci, but the presence of sinus disease did seem to favor resistance to treatment as found by Cleminson.[4] The teeth were not investigated.

Below are the summaries of findings in the carriers examined, the operations done and their apparent influence on the course of the condition. No attempts were made to correct septal deformities for fear that meningitis would be incited. However, no such untoward results followed any of the other procedures. During the patients' stay at Rockefeller Hospital, except immediately following an operation, they received intensive chemical treatment. "After nasal irrigation with mildly alkaline isotonic solution of sodium chloride and bi-carbonate of soda, the patients were kept for 20 minutes in a chamber of 556 cubic feet capacity into which 800 c.c. of a 2% aqueous solution of chloramine-T were nebulized by means of a steam injector and forced into the chamber by a fan. The apparatus was so regulated as to maintain the maximum concentration which the patients could endure without serious discomfort. In the first treatments weaker solutions were used until the patients became accustomed to the vapor. After shallow inspirations, the patients were instructed to expel the air forcibly in order to force the vapor high into the vault of the pharynx." This is all the treatment some of the men received while at the hospital, and all had been treated by various chemical means before admission. The chloramine treatment was irritating to all, leaving the mucosa much congested, causing a stubborn cough in some, and in one (No. 18) after rather prolonged treatment causing chills, fever and a morbiliform rash, whenever exposed.

MEN EXAMINED	DEFOMITIES, NOSE	SINUS DISEASE
37	27, 73%	9, 2.4%

DISEASED TONSILS	ADENOIDS
26, 70%	36, 97%

Unfortunately, no series of normals from similar bodies of men were available at the time of this study, but the above are obviously high percentages of lesions in young men varying from 17 to 36 years of age, and chiefly in the early twenties. This is especially true of the presence of adenoids, which were remarkable not only for their frequence, but for their large size. The tissues removed were examined for the presence of meningococci and none were found. This may be explained by the difficulty in finding Gram negative organisms in sections and the delay in inoculating media with so delicate an organism, if they were present as suspected.

The influence of operative treatment of the lesions found on the persistence of positive cultures was as follows:

MEN OPERATED UPON
16

AVERAGE TIME CARRIERS ON ADMISSION
74.2 days

AFTER OPERATION
32.5 days

Four men, No. 8, No. 10, No. 14 and No. 21, received no operative treatment because no lesion was found which seemed to require an operation, or because they showed negative cultures previous to the time set for operation and became negative in an average of 22 days after averaging 53 days as carriers. One of them had his adenoids removed after his cultures were negative. Two men, No. 17 and No. 18 did not become free after 150 days of treatment, although both had their naso-pharyngeal lesions corrected, one having adenoids and tonsils removed, and the other his adenoids removed, his tonsils being already out, and also a stubborn left maxillary sinusitis cleared up by irrigations. These two, only, of the twenty-two treated did not clear up, and only one case, No. 1, became positive again after being discharged as negative. He had a right maxillary sinusitis, cured by irrigations, and refused permission for removal of his tonsils and adenoids, which was advised. Two cases, No. 13 and No. 19, were very stubborn in becoming negative. No. 13 had a right maxillary sinusitis which was promptly cured on irrigations, but did not have his tonsils and adenoids removed, as he showed irregularly negative cultures throughout his stay of 95 days before discharge. No. 19 had his tonsils and adenoids removed but showed a marked hypertrophy of the lymph follicles on his

posterior pharyngeal wall, and only became negative after 110 days.

The operations done were:

Adenoidectomy	16 cases
Tonsillectomy (bilateral)	9 cases
Antra irrigated	5 cases
Nasal polyp removed	1 case

One case, a naval aviator, seen recently, and not included in the tables, showed the effect of removing adenoids in a striking manner. He was found to be a strongly positive carrier in attempting to locate the source of another case on January 6, 1919. He showed his nasal septum to be deflected to the right, with a ridge near the floor of the nose, a small amount of tissue in each tonsillar fossa, following an old tonsillotomy, the presence of adenoids and hypertrophy of the lymph follicles on the posterior pharyngeal wall. He showed strongly positive cultures for 95 days, in spite of vigorous chemical treatment, and a six weeks' rest under the best possible conditions, in the open air, in the South. On removal of his adenoids and the hypertrophied lymph nodes on the posterior pharyngeal wall by Dr. Cornelius G. Coakley, April 16, 1919, the tissues showed meningococci on culture, but none were recognized in sections. All cultures taken after the operative area had healed were negative, and he was finally discharged May 9, 1919.

The conclusion which we may draw from these facts are that

1. A group of very resistant meningococcus carriers showed a high incidence of abnormalities in their nose and pharynx, particularly the presence of adenoids.

2. That the folds and depressions of adenoids make an ideal protection from disinfectants to meningococci at their depths.

3. That the correction of diseased conditions of the nose and throat were of considerable aid in eliminating meningococci from chronic carriers.

4. That all resistant carriers should be carefully examined for diseased conditions of the nose and throat and those conditions corrected, especially should adenoids be removed.

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CASE SUMMARIES.

Case	Time Carrier	Nose	Sinuses	Tonsils	Adenoids	Operation	Carrier post-op.	Remarks
167th Inf.								
1, C. B.	87 days	+	+	+	+	R. A. irr.	42 days	A. & T. refused —recurred after discharge
2, J. W.	87 days	—	+	—	+	Adenoid	37 days	
3, J. A. P.	87 days	+	—	+	+	A. & T.	13 days	
4, E. C.	87 days	+	+	—	+	R. A. irr. Polyp Adenoid	32 days	
5, J. McR.	87 days	+	+	+	+	Antra irr. A. & T.	13 days	
6, C. H.	87 days	—	+	—	+	Adenoid	5 days	
7, C. D.	87 days	—	—	+	+	A. & T.	5 days	
8, H. S.	87 days	—	—	—	—			Neg. 42 days
9, A. H.	87 days	+	—	—	+	Adenoid	14 days	
Fort Wood								
10, S.W.McL.	3 days	+	—	—	+			Neg. 7 days Adenoidect'my later
Navy								
11, E. A. C.	60 days	+	—	+	+	A. & T.	14 days	
12, S. J. W.	62 days	+	—	+	+	A. & T.	14 days	
13, W. H. M.	56 days	+	+	+	+	R. A. irr.	95 days	
14, G. B. K.	48 days	+	—	+	+			Neg. 17 days
15, D. W. B.	69 days	+	—	—	+	Adenoid	19 days	
16, H. S. B.	65 days	+	—	+	+	A. & T.	19 days	
17, F. W. C.	68 days	+	+	—	+	L. A. irr. Adenoids		Pos. after 150 days
18, E. K. H.	50 days	—	—	+	+	A. & T.		Pos. after 150 days
19, A. H. F.	78 days	+	—	+	+	A. & T.	110 days	
20, A. D. H.	17 days	+	—	+	+	A. & T.	63 days	
21, F. W. H.	74 days	—	—	—	+		24 days	
22, A. L. L.	84 days	+	—	—	+	Adenoid		Neg. 17 days
23, M. H. P.		+	—	+	+			
24, C. C. T.		—	—	+	+			
25, G. A. C.		+	—	+	+			
26, C. E. S.		+	+	+	+			
27, C. A. G.		+	—	+	+			
28, J. G. A.		+	+	+	+			
29, H. R. H.		—	—	+	+			
30, G. F.		+	—	+	+			
31, R. O. M.		+	—	+	+			
32, A. A. M.		+	—	+	+			
33, G. W. F.		+	—	+	+			
34, W. M. W.		—	—	+	+			
35, H. K. B.		+	—	—	+			
36, A. H. S.		—	—	+	+			
37, R. L. F.		+	—	+	+			

Explanation: + means a pathological condtion. — means no pathological condition. R. or L.A. irr. means right or left antrum irrigated. A. & T. means Adenoidectomy and Tonsillectomy. Adenoid means Adenoidectomy. Polyp means Nasal polyp snared.

A CASE OF CHRONIC PURULENT OTITIS MEDIA COMPLICATED BY THROMBOSIS AND SUPPURATION OF THE TRANSVERSE SINUS, EXTRADURAL-ABSCESS AND CEREBELLAR ABSCESS. OPERATION AND RECOVERY.

Dr. H. Tanaka, Takasaki, Japan.

Case reports of intracranial complication following otitis media have been rather frequent in recent otological literature. Most of these cases, however, prove fatal; only cases of extradural abscess or of sinus thrombosis show more favorable results. Prognosis in brain abscess is bad, but occasionally a case of brain abscess involving the temporal lobe is reported with a favorable outcome. As regards cerebellar abscess, reports of cured cases are very few.

Suppuration in the temporal bone may invade the cranium and cause infection in the lateral sinus and also the transverse sinus. The path of the infection is either through the destroyed bone (Korner) by osteophlebitis, or by a emissary vein (Jansen). Occasionally infection of the transverse sinus may come from the dura or from the surrounding thrombus.

The following case report presents some very unusual features:

Miss K. H., 14 years of age. First seen August 14, 1918.

Family History: Unimportant.

Personal History: The young lady is stout. At the age of four years she had an exanthem on the head, which yielded easily to treatment. When the patient was six years old, while in bathing, some water entered the left external auditory canal, which gave rise to an acute otitis media. This has persisted until the present day more or less, and as a result of this disability she became hard of hearing on the left side.

Present History: Since February, 1918, this deafness has become worse and the discharge has become foul. The patient states that she had several attacks of vertigo. By the end of July the vertigo as well as a headache and earache, of which the patient complained, became exacerbated, and she consulted an ear specialist, who, on two occasions, enlarged the drum perforation. Some relief resulted from this procedure, but it was only temporary, for all the symptoms became even more aggravated, and the discharge began to diminish in amount. No fever was present until August 14th, when the patient suffered a severe chill accompanied by a rise in temperature to 40 degrees C., and nausea and vomiting.

It was at this time that the writer was called in consultation, and he advised immediate operation. Consent was not obtained, however, for two days.

Examination: Patient unable to stand up because of vertigo. Every motion causes pain. Urine normal; no nystagmus or paralysis. Headache severe in left frontal region. Right ear normal, left ear aching, foul sanguineous discharge. External auditory canal reddened on inner half but no sagging of the posterior-superior wall. Perforation of the drumhead located in the center and moderate in size. Drumhead surface conjested, especially posterior portion. The mucous membrane of the tympanum as seen through the perforation, swollen and very conjested. Discharge poor. Mastoid region sensitive to touch, but does not show swelling.

Operation: Under local anesthesia; mastoid exposed by the usual T incision; duration of operation five minutes. As soon as the cortex was penetrated a large amount of foul pus gushed out. The antrum was opened and found filled with a cholesteatomatous mass. Opening further, enlarged sinus exposed, but no abnormal condition of the sinus wall was found.

August 18 (second day after operation): Patient had chill; fever 49.8 degrees C., pulse 120.

August 19: Bandage changed. Very little pus from the wound. Fever subsided gradually.

August 21: Chill; fever 40 degrees C., pulse 120. Bandage changed again and fever subsided.

August 22: There appeared considerable infiltration in the subcutaneous dura of the infraclavicular fossa, sensitive to pressure.

August 23: Elevated the periostium two centimeters backward, and with a chisel exposed the transverse sinus in the sigmoid fossi three centemeters long. It was yellow, and showed no pulsation. Puncturing proved that it contained pus instead of blood. Incision for a distance of 2½ centimeters and a thick yellowish pus flowed out but there was no bleeding. A probe inserted along the course of the sinus, namely, upwards and backwards for a distance of 2½ centimeters, and downwards for a distance of 1½ centimeters brought about a sluggish bleeding. Iodoform gauze pack inserted. Culture showed pure staphylococcus albus from sinus pus.

August 25: After the sinus operation the patient seemed a little better but today the fever rose to 38 degrees C., pulse 70 and full, patient felt very weak. Assuming that there was another focus of infection somewhere, I resected the external sinus wall

for a distance of two centimeters; then I searched in all directions in the wound and found the pus anterosuperiorally, namely, in the fossamedia. Another focus was discovered anteroinferiorally, but the amount of pus here was less than in the former place. There is no clinical sign of internal ear disease.

August 26-30: Patient is free from fever and her general condition is better, except a headache, which is located in the left frontal, temporal, and parietal regions. The headache is more intense at night and prevents sleep. There is still some pus exuding from the extradural abscess cavity, but it is scanty and has no odor. If I insert the probe for a distance of five centimeters into the upper crus of the sinus it causes active bleeding. If it is inserted for the three centimeters into the lower crus there is sluggish bleeding and it encounters a hard resistance.

August 30: Most of the headache has disappeared except slightly in the left frontal region. The patient is able to sleep better. Pulse is below normal.

September 1: While in conversation with me the patient complained that she was very sleepy and fell into a stupor from which she could not be aroused. Suspecting the presence of some fossi in the brain, I cleaned the wound with hydrogen peroxide and searched for an abscess 1½ centimeters deep in every direction, but with an entirely negative result.

September 2: Coma persists, pupils dilated, equal on both sides, and do not react to light. Corneal reflex still present. Horizontal-rotary nystagmus. Temperature 38 degrees C., pulse 65; battelar, bisepts, and Achilles reflexes could be elicited. The neck seemed stiff. Lumbar puncture showed clear cerebral spinal fluid. Upon drawing the gauze tampon from the wound some pus flowed out. I did not reinsert it, but only covered the wound with iodoform gauze. Patient given a camphor injection. Within five minutes she regained consciousness and complained of severe vertigo and headache. There is slight motor aphasia. Her speech is very retarded, and most of the words she uttered were incomprehensible. Eye examination showed slight choked discs on each side. Nystagmus continued for almost an hour. Then the comatose condition recurred, from which she again recovered, but it was repeated almost every hour or two, and the patient was pronounced to be beyond hope. As her mother felt that she would rather have her daughter expire in her own home the patient was taken to her house. But the patient did not expire.

September 3: A little pus flowed out from the extradural abscess cavity. The wound was found to be filled with coagulated blood. No tampon inserted, in order to avoid irritating the brain and producing pressure upon it. Patient is somewhat better. She has had only two comatose attacks, and these were of short duration. Motor aphasia disappears.

September 4-11: No tampon. Wound carefully cleaned out every day with hydrogen peroxide. Patient's general condition very much better. Appetite is good; headache has almost disappeared.

September 12: Until this day most of the attention has been directed to the intracranial condition. Middle ear condition looked after.

September 18: Trying to lie on the diseased side caused a sudden vertigo lasting thirty minutes. Slight headache and vomiting. Cranial wound covered with unhealthy granulations which were curetted. In the afternoon the patient had two comatose attacks, each lasting five minutes. When she recovered from them she had a slight disturbance in speech, which, however, disappeared after two or three hours.

September 19: Patient has severe headache, nausea, vomiting, and a comatose attack, accompanied by opisthotonos. Right eye, (healthy side) shows micropia and diplopia. The skin has grown over the sinus and covered the wound. Skin resected and unhealthy granulations in the wound removed for the purpose of lessening the brain pressure. This procedure caused a rapid disappearance of all symptoms, and the patient felt very well, but the diplopia in the right eye remains. No paralysis.

September 20 to October 8: Patient improved, diplopia and micropia disappeared.

October 9: Slight headache and some speech disturbance. Exuberant granulations in the wound removed. During the night the patient fell into a comatose state. Speech disturbance and loquacity came on alternatively. I examined the wound and found some edematous granulations which I removed.

October 10: Patient is conscious; left abducens paralysis, hyperemia in the right eye, amblyopia on the same side, and very slight nystagmus toward the left or diseased side.

October 13: Headache, vomiting, and ataxia of left extremities. But she was able to perceive a little louder sound than usual in her left ear. Examination for vestibular function not possible owing to the patient's condition. Choked discs. Suspecting a cerebellar abscess, I chiseled away the bone, and explored, but

no pus was found. However, believing in the presence of pus deeper down I cut into the cerebellum for a distance of one centimeter, but no pus was obtained. I probed, but could obtain no pus. In the deepest portion of the wound I noticed a yellowish white mass and pulled it out with very slight resistance. This threadlike necros tissue measured one centimeter in length and one millimeter in thickness. When this was extracted about 2 cc. of yellow pus gushed out from the depth of the wound. Culture showed it to be nestaphlicoccus albus. Abscess cavity drained and iodoform pack inserted.

October 19-22: Patient's general condition is very much better. Nystagmus disappeared two days after evacuation of the pus. The abducens paralysis and cerebellum ataxia still present. Patient's appetite good.

October 23: Wound perfectly clean. There was no pus or granulation; no headache or nausea, no speech disturbance. All the symptoms have vanished with the exception of the cerebellar ataxia of the left extremities and the abducens paralysis in the left eye. The patient can change her head position on the pillow by herself without any discomfort. With each pulsation there is a gush of cerebrospinal fluid which has tended to wash the wound clean. Since this day the wound has become smaller daily and the loss of cerebrospinal fluid, which amounted to perhaps several hundred cubic centimeters, has lessened gradually. During the patient's convalescence she was taken sick with influenza. Notwithstanding the illness through which she had passed, she recovered from it.

November 10: The wound is closed. There is still some ataxia. The abducens paralysis has almost entirely disappeared, the left eye being almost normal.

Ear Examination: Weber to right; Rinee, right, negative, left, negative. Watch, right, 12/200, left, 3/200. Right ear ten inches, left ear, conversational voice, twenty inches.

Ataxia has become gradually better, and in January she was able to walk with the aid of a cane. Eye examination by Dr. Takahashi is as follows: "Both eyes normal in the cornea, sclara, conjunctive, iris, and muscular movement. Reaction to light of pupils are normal and shape and size are the same in both eyes. Ophthalmoscopic examination shows papilli in both eyes pale, veins and arteries in the fundus are thin and visual fields in both eyes are narrowed concentrically. There is no paralysis or diplopia. The patient is able to discern the finger with the right eye at one meter, with the left eye at one half meter. Diagnosis, atrophia nervi optica."

NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

May 28, 1919.

Laryngectomy Four Years After Operation, With Good Speaking Voice.

Presented by DR. JOHN E. MACKENTY.

Mr. E., 51 years old. This patient was presented for two reasons: First, it was a rather desperate case at the time of operation—it seemed too advanced for operation; second, because it is claimed by some that it is useless to operate on such cases. This case presented many adverse features, the principal of these being involvement of the tissues anterior to the larynx in the neck. When the patient came to the hospital four years ago a tracheotomy had to be performed. The tube was worn for about a month before the larynx was removed, together with everything else that could be spared in the neck. Infection caused extensive sloughing after the operation. Six weeks later a plastic was performed and the hypopharynx was closed. The patient was seen occasionally for two years and then disappeared from observation and it was thought that he was probably dead.

Recently, in making up some statistics a letter was sent to his last address and one day the man called up over the 'phone and inquired whether he could come to the office, giving his name and saying that he had been operated upon at such and such a time. It seemed almost incredible that this could be the laryngectomized patient, so good was his speaking voice. The voice is produced by filling his stomach with air and then gradually letting it up into the pharynx, where by some peculiar muscular control the necessary vibrations were produced to make a loud voice. He counted on one stomachful of air up to 20. So good is the voice that many of his friends do not know that he has anything but a hoarse voice.

DISCUSSION.

DR. MACKENTY said that the man could not speak as distinctly after eating as before eating. This man was very intelligent and had taught himself, and had no difficulty in talking to his friends and making himself understood.

The case was a demonstration of the fact that one can remove the larynx, and that the patient can later come back to a practically normal condition of life.

In reply to an inquiry as to whether the man could speak as well after dinner, Dr. MacKenty replied that he could not speak so well as when his stomach was empty.

DR. ARROWSMITH said that Dr. MacKenty every now and then surprises the members by the almost magical results he obtains by his operative procedures on cancer. This case and the one recently presented by Dr. Hurd were phenomenal in their methods of producing the voice sounds and there must be some peculiar adaptability of the individual patient.

Last year he had himself presented a patient who had made every possible effort and tried all the methods suggested, but succeeded in obtaining only a fairly intelligible whisper that could be heard not more than three or four feet away. This case was only one of the few surprising results that Dr. MacKenty had shown, apparently cured. He has the best record that has been reported.

DR. CARTER said that the result was remarkable and nothing but admiration could be expressed for such a case. He had never before heard of such a method of securing the vocal sounds, and asked if this method of developing a voice was something absolutely new. The case showed wonderful skill in the way it had been handled.

DR. WHITE said that he had seen the patient during his, the patient's, stay in the hospital, but when he saw him tonight, conversing with Dr. MacKenty, in the outer room, he thought he was a member of the section! He also stated that he had seen a great many cases with similar conditions, mostly Chiari's patients, and although they spoke well under the circumstances, not one of them could speak nearly as well as this one. This was the best result he had ever seen.

DR. MACKENTY stated that he had seen sixteen cases operated upon by Chiari during the summer of 1912.

Dr. MacKenty expressed his appreciation of the remarks made by Dr. Arrowsmith and Dr. Carter and said that he deserved no credit for the character of the voice. The man simply had the intelligence to develop the voice and he lived long enough to do so; the main results had been acquired in the last eighteen months. Probably many of them could be taught if they had some instruction. This case should be brought to the attention of Dr. Greene, to see if he could learn the method used in the production of an audible voice. It would be a great advance if such patients could learn to speak after the operation. What they most dread is the loss of the voice.

Bone Transplantation for Correcting Deformity. Presented by DR. W. W. CARTER.

This was the patient reported to the section some months ago, but through some misunderstanding the man got away before being seen by all the members. He was now presented in order that the end results might be seen in a case of bone transplantation for correcting nasal deformity. The only way to really learn about these results is to follow up the cases some time after the operation, for what is desired is an ultimate good result and very little can be determined immediately after operation. This case also demonstrated a little difference in the technique from that usually employed, the bone shavings being used to fill in the depressions at the side of the transplant.

The patient is 28 years of age, and when 14 had suffered an accident in which the nose was smashed, the only treatment he had at the time being the application of adhesive plaster strips. That left his nose lower than it would have been otherwise, and it was completely obstructed. Later someone did a submucous resection, and they used the bone and cartilage in trying to build up the bridge, but the result was not satisfactory.

When the patient came to Dr. Carter he had quite a marked deformity. He was operated upon last November. First he chiseled up the nasal process of the superior maxilla on both sides, breaking up all the bony structures, then pulled them together, and transplanted a piece of bone from the rib, 1½ to 1¾ inches long. In cases previously operated upon, it was noticed that some time after the operation there was considerable depression on each side of the transplant, so all of this depression was filled in with the bone shavings taken from the transplant in shaping it. The young man was out of the hospital six days after the operation, and there was no more reaction than after an ordinary bone transplant. The result now was exceedingly satisfactory; the bone was perfectly firm, union was thoroughly established with the frontal bone, and there was no danger of breaking it with any amount of force. Besides, the cosmetic effect was especially gratifying.

DISCUSSION.

Dr. MacKenty said that this was one of the best results he had seen for a long time. Dr. Carter had succeeded wonderfully in preserving the natural contour of the bone, and the Greek type of the nose. If Dr. Carter could only succeed in devising some scheme of getting the natural depression at the junction of nose and brow, it would be still more satisfactory. It would also be interesting to know if Dr. Carter had devised any method of raising the tip of the nose. This is a point that needs our attention to acquire,—not only raising the tip, but the lowering of the columella so that it is on a lower plane than the alae.

Dr. Carter, in reply to an inquiry about a scar on the nose, said that that was made before he saw the case by the man who did the septum operation; he had transplanted the septal tissue through an incision made in the dorsum of the nose.

Dr. MacKenty had spoken of raising the tip. Dr. Carter said that he had already reported one or two cases, with photographs, in which he had raised the tip, and a case was now in the hospital in which the patient had no septum at all. In this case a septum was made by transplanting a flap from the arm; the tip was then raised by transplanting some cartilage. In a case from up state that was done about three years ago, he had transplanted bone between the columellae. The case done recently was still in the hospital and would probably be shown later, as there were some very interesting features to it that had not been described before.

Epidural Abscess Secondary to Frontal Sinusitis and Ethmoiditis. Presented by Dr. John D. Kernan.

The patient was a colored man, 25 years of age, who was admitted to Dr. Coakley's clinic at Bellevue on the 21st of March. His previous history was of no interest excepting for the fact that he had had a chancre nine years ago. A month ago his trouble began with a violent headache over the right eye, which became swollen. The pain was constant, and increased, and finally went around the forehead. It seemed as though there was a growth over the frontal region, with severe pain. (Pictures showing the condition).

Physical examination: Over the right frontal region was a swelling about 6 cm. in diameter; the mass fluctuated in places. The rest of the examination was negative for eyes and eyegrounds, and all the reflexes, so that this lesion had not affected his general condition, excepting for a slight stupidity.

Neurological note: Left eye reacts a little sluggishly to light; ptosis, probably due to inflammation; no facial paralysis apparent. The condition of the external eye muscles is probably due to pain. Deep reflexes, lower extremities, exaggerated. No Babinski; no clonus. Upper extremities normal. Abdominal present.

Intra-nasal examination: Both nasal cavities were filled with polyps, and the antra were full of pus. (Pictures showing the condition of the patient and operative procedure).

The operation consisted of an incision from the median line to the external border of the supra-orbital ridge, extending along the ridge on the right side, and carried vertically up in the midline for 2½ inches. Pus exuded from an abscess cavity. The periosteum was eroded and the bone was soft, with granulation tissue pushing through it. The bone overlying the frontal sinus was removed. The sinus was very small, but filled with granulations. It was curetted clean. The plate overlying the dura was necrotic. This was removed and abscess pockets were found underlying the dura. There seemed to be a general osteomyelitis of the whole right frontal bone. The dura was covered with granulation tissue. It was exposed for about three inches above the supra-orbital ridge and an inch and a half to the left of the median line. On account of the patient's condition, the operation was stopped before removing all the dead bone.

He made a good operative recovery and was discharged from the hospital a month after the operation.

He came back recently for the removal of a sequestrum, which included a considerable portion of the left supraorbital ridge. The ethmoid region on the right side was at the same time cleared of polyps through an external incision. He has made a good recovery from these procedures.

Case 1. Naso-Pharyngeal Polypus in a Child of Thirteen. DR. FRANCIS W. WHITE.

The patient was a little girl, thirteen years of age, her age being the main reason for the presentation. Two years ago her tonsils and adenoid were removed, but there has been a gradual and increasing obstruction of the right side of the nose for about a year. This side of the nose was completely filled with polyp and she spoke similar to an "adenoid" child.

Upon examination, the right side of the nose was seen to be blocked by a mass similar in appearance to a polyp. Upon shrinking this mass and the neighboring structures in the same nasal cavity, it could be seen that the pedical led up into the middle meatus, and from there into the hiatus semilunarus. Following the mass posteriorly it was seen to pass through the right choana into the right side of the naso-pharynx. Then upon examination through the mouth, the lower end of the mass could be seen presenting slightly below the margin of the soft palate to the right of the medium line.

Such a large polyp in a child of this age is somewhat rare. To remove this mass under local anesthesia would undoubtedly be a very difficult operation. I have decided to do it under a general anesthesia.

The x-ray picture shows granulations, or thin pus in the right frontal sinus, ethmoidal labyrinth and antrum of Highmore. At no time has there been a purulent discharge, but that does not preclude the presence of a low grade suppurative sinusitis. A growth of this size does not of necessity depend upon the presence of a suppurative sinusitis.

DISCUSSION.

DR. HUBBARD asked how Dr. White was so sure that it was a polypus, and on being told that it was on account of the microscopical evidence, said that he had had a somewhat similar case and could only remove the polyp with the Brandigee forceps.

Case 2. Specific Laryngitis. DR. FRANCIS W. WHITE.

As in the first case, the age of this patient is the interesting factor. This little patient has been losing weight and appetite, but has slept well. She is markedly anaemic, and has the appearance of a mouth breather, although I am told the tonsils and adenoid had been removed some time ago. The swelling over the right nasal bone at the inner canthus of the eye immediately attracts your attention, but she came to the clinic not on account of this condition, but on account of hoarseness, and at times almost complete loss of voice. Upon examining the nasal fossae, we find there is marked thickening of the nasal septum, and an induration of the turbinates.

Upon laryngeal examination it is seen that the epiglottis is markedly swollen and infiltrated with ulceration of the tip. The swelling continues downward, so much so, that very little can be seen of the false and true cords. This condition, including the intra-nasal appearances, naturally makes one suspicious of a luetic infection. This suspicion was corroborated by the Wasermann test, the report being returned 4 plus. You will also notice that the second teeth show marked notching. The patient has also suffered attacks of bronchitis. The x-ray picture showed bilateral ethmoiditis, especially of the right. As you know, considerable work has been done recently on sinusitis in association with bronchitis in children.

I have purposely withheld the history of this patient until the last, as it is very interesting. This child is only seven years of age, and yet, clinically, is suffering from a specific infection of the larynx.

This is the ninth child in this particular family, and the only one that showed any condition of a specific nature. In obtaining the family history it was elicited that while this child was being nursed by the mother, she, the mother, was suffering from a skin eruption and later underwent some treatment for lues. I am also informed that the mother is now under treatment for this condition. At the age of two years this little patient also had a skin eruption, which entirely disappeared, leaving no marks whatsoever. The hoarseness complained of by the patient has gradually increased in the last six months.

Both of these interesting cases are from the clinic of Dr. Harmon Smith, at the Manhattan Eye, Ear and Throat Hospital.

DISCUSSION.

DR. MACKENTY said that he was especially interested in the specific case, and was very glad that Dr. White had presented it. In twenty years of hospital experience he had never seen two cases of syphilis in this situation in the throat of a child.

DR. ARROWSMITH said that the occurrence of polyps at the age of thirteen was very unusual. The few cases that he had seen had been practically all in girls, and he wondered why that was. Had others noticed the same thing?

DR. WHITE asked Dr. Arrowsmith concerning the age of the patients, and also regarding the method of removal of the growths. Dr. White then stated that he had had some fortunate experiences in the removal of post-nasal growths, and described in detail the method of removal, as follows:

A piece of snare wire of appropriate weight, this naturally depending upon the expectant resistance of the growth to be removed. This wire should be 14 or 16 inches in length. It is then doubled upon itself, thus forming a long loop. One end of a silk ligature of about the same length as the wire, Number 10 to 13 in size, is passed over the free ends of the wire in the form of a double half-hitch, and is made fast about an inch or inch and a half from the ends of the wire. It is then wound tightly from below upward to the free ends of the wire, and is again secured by a double half-hitch. All of this portion, and a portion of the ligature material for about an inch, is then securely wrapped with a piece of adhesive tape, corresponding in length to the dimensions just given. To remove a naso-pharyngeal growth, the Bellocq canula is then passed through the nasal cavity corresponding to the side to be operated upon. The free end of the silk ligature is then made fast to the end of the canula presenting in the patient's mouth, and as the canula is withdrawn, it naturally is followed by the ligature and snare wire. As the distal end of the wire loop comes in proximity to the growth, it is gently guided by a finger of one hand posteriorly to the mass, and is then followed upward until the posterior edge of the nasal-septum, and the structures helping to form the choana of that side are easily palpated. In other words, the loop should be above and behind the growth before strong traction is made, otherwise, there will simply be a cutting through of the growth, at a considerable distance from its point of origin.

When it is decided that the growth has been fully encompassed at the point desired by the wire loop, and the necessity for the use of a snare is indicated, the snare wire is cut at the desired distance from the nostril, and is then threaded or made fast to the snare, and is used in the ordinary manner.

If, however, the growth is not of a resistant character, traction by the hand may be used. In either case, and this is very important, a suitable grasping forceps must be applied to the lower end of the growth which presents into the pharynx, and either the operator or an assistant quickly withdraws the growth through the mouth the moment after the snare has severed the end that is attached. Otherwise, the growth would naturally drop into the oro-pharynx, and would cause some embarrassment, if not grave danger.

Instead of using ligature material, as above described, to tie the ends of the snare wire together, each individual end of the snare wire may be bent and securely closed upon the ligature material, by means of pincers, and then the ligature securely tied. But this junction of wire and ligature must be thoroughly covered, as previously described, with adhesive plaster. Not only does adhesive plaster prevent the sharp points of the wire from sticking into the parts over which they are to pass, but also forms a flexible portion not as resistant as the wire, nor as flacid as the ligature. This prevents, when traction is made, the inevitable sharp angle which occurs at the junction of the wire and silk ligature.

Great care must be exercised to prevent the wires becoming crossed before engaging the growth, as it is very easy to form a false loop and consequent failure to remove the growth en masse.

Salivary Calculi. Presented by DR. ARROWSMITH.

Dr. Arrowsmith said that he had happened to get two very good radiographs of salivary calculi, and according to his experience in the earlier days of x-ray work this was a very unusual result. (Demonstration).

DISCUSSION.

DR. CARTER said that these calculi in the salivary ducts are very painful. When he had reported his own case before the section some years ago the mere recalling of the facts almost brought tears to his eyes. He himself had had one right in the beginning of the duct, and it was so far back that it could not be felt and was very difficult to remove. When they are in the floor of the mouth they are easy to remove, but when far back it is very difficult to get them out. The only way it was gotten out in his own case was by his pushing it forward with his thumb while it was being cut out. It was one of the most painful experiences of his life. That stone was about half as large as the one shown by Dr. Arrowsmith. Just as soon as one sees food, the attack comes on, and the whole neck on that side becomes swollen. The pain was unbearable and he lost no time in having an x-ray picture made and the cause removed.